MUNG BEAN

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SCIENTIFIC RESEARCH INSTITUTE OF COTTON BREEDING, SEED PRODUCTION AND AGROTECHNOLOGIES

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Mung bean Monograph -India. “Novateur Publication, India 2020, 64-pages.

This monograph provides information on the biological and morphological features of mung bean, their history and current status, importance in the national economy, their role in increasing soil fertility, their role in crop rotation, classification of varieties of mung bean grown in the country, its diseases and pests and control measures.

This monograph is based on the data of modern science and experiments on mung beanes in the country, as well as abroad, as well as the results of research and observation conducted by the authors in scientific research.

The monograph is intended for agricultural specialists, students studying in this field, independent researchers, farm managers and the general public.

Editor: Dr.(Er) Parimita- *Sam Higginbottom University of Agriculture, Technology & Sciences, Allahabad, India*

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From Editor's Desk

"I will instruct you and teach you in the way you should go; I will counsel you with my loving eye on you" (Psalm 32:8)

"But God hath chosen the foolish of the world to confound the wise; and God hath chosen the weak of the world to confound the mighty" (1 Corinthians 1:26-31)

First and foremost I earnestly praise the **Almighty GOD** the most gracious and merciful who enabled me to edit this book.

Foremost I wish to express my plethora of thanks to **my Godfather** and our **Hon'ble Vice Chancellor Most Rev (Prof) Dr. R.B.Lal** for providing me an opportunity to work in the admirable intellectual atmosphere of SHUATS, Prayagraaj U.P. India.

My diction doesn't seem too rich enough to provide suitable words to articulate my sincere and heartfelt gratitude to my husband who is my friend, philosopher, guide **Mr. Manoj Khatri**, who has given sound and fruitful advices, immense support also being a constant encouragement throughout my life and venture of this study despite the significant changes it involved in our lives, for which I am greatly indebted to him, as without his everlasting love I would not have come up to this level. I would also like to thank my daughters, **Rechal** and **Sarah**, for their boundless love, understanding and encouragement to finish this book.

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SHORT –BIO OF EDITOR

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Done BSc +M. Sc. (Adv Nut & Dietetics), B.Tech +M.Tech (FT-Food Process Engg), PhD. (Food Technology). She has been engaged in academics and research from fifteen years. Guided over twenty five PG research works and guiding two PhDs in the field of food technology. Completed a project and currently working on one *Project* granted by Directorate of Research, SHUATS. She has one *trademark*: Dark chocolate jam under the brand name "Aggies". She is guest faculty as UGC- Faculty trainer. Published * twenty five research papers* in national and international journals. Also published two *reference books* based on research titled "Technology of Pretreatment Kinetincs: *psidium L*. Fruit Cultiver" & "Herbal Immunity Boosters: Indian Innate Reflux to Combat Covid-19 Pandemic. "STRAW TO SHOW THE WIND"-1"

CONTENT

INTRODUCTION

The formation of the Republic of Uzbekistan as an independent state has led to comprehensive change and development for the Uzbek people. The conditions of market relations require the development of the economy in a new direction, in a new system. Economic independence has led to radical changes in the system of agriculture in the agro-industrial complex, which is the most important sector of the economy. After independence, the system of agricultural production changed and the cotton monopoly was abolished. The foundations for achieving grain independence have been laid.

Decree of the President of the Republic of Uzbekistan dated February 14, 2017 F-4849 [1] "On organizational measures to implement the Action Strategy for the five priority areas of development of the Republic of Uzbekistan in 2017-2021" to fully meet the needs of the population in food and markets In order to ensure the stability of prices for agricultural products, such important tasks as planting replanted crops on the vacated lands of cereals, in fact, increase soil fertility in the Republic, meet the needs of the population in food products is a priority.

Uzbekistan is one of the most favorable regions for agriculture in the world due to its natural climate and soil conditions. The basis of agricultural crops grown on irrigated lands of the country are cotton and winter cereals. Every year, more than one million hectares of irrigated lands of the country are planted with autumn cereals. This means that once the winter wheat is harvested, there will be an opportunity to grow repeat crops on the same amount of land. In this regard, the cultivation of legumes, cereals and vegetables, which meet the daily food needs of the population in the areas free of winter wheat, will further strengthen food security in the country, fully meet the needs of the population in agricultural products.

In the soil climate of the country, there is an opportunity to grow 6-7 t / ha of winter wheat, 1,5-2,5 t / ha of mung bean, soybean and bean crops grown as a second crop, and 7,5-9,5 t / ha of grain grown in one season. This has been observed in many scientific experiments and on the example of advanced farms. From this point of view, in exchange for expanding the area under legumes in the areas freed from winter wheat, first of all, it will provide the population with nutritious and quality products, and livestock with cervitamine, mineral-rich feed. Among such legumes, along with soybeans, beans, peas, mung bean also has its place.

In many respects, a complete diet depends on its composition, the necessary amount of nutrients and quality substances necessary for normal human development and functioning, proper metabolism in the body, strengthening health, disease prevention, slowing down the aging process and prolonging life. depending on. These nutrients, vitamins and trace elements are found in large quantities only in legumes: Mung bean, soybeans, beans, and can not be replaced by any other product.

Therefore, the creation of promising technologies for obtaining a rich and high-quality crop in agriculture, thereby increasing productivity, development of measures to increase agricultural production in the country, maintaining and increasing soil fertility through the right choice of agricultural crops Further improvement of crop rotation systems that meet the demand for food products and ensure high and quality yields of cotton, wheat and other agricultural crops, development and introduction of agro-technologies for the cultivation of primary and secondary legumes grown in these crop rotation systems remains the demand of the period.

The solution of these problems plays an important role in the agricultural economy of the republic. Farms in well-watered areas of the country have the opportunity to plant more than 30 species of crops as secondary crops, which will increase soil fertility after the harvest of cereals and provide the population with food and nutritious food. This is a topical issue at a time when farming is developing. From such crops it is possible to maintain and increase soil fertility by planting mung bean as a secondary crop. This, in turn, will help to meet the demand for food by ensuring the production of high quality grain from this crop.

CHAPTER I. HISTORY OF MUNG BEAN CULTIVATION IN THE WORLD AND IN UZBEKISTAN

1.1 Systematics, biological and morphological features of mung bean

Mung bean (Phaseolus aureus Pip) is an annual herbaceous plant that belongs to the legume family (lesominosol).

As Mung bean is a type of bean, its taxonomy is considered on the basis of beans. There are more than 200 species of Phaseolus, of which about 20 species are used as cultivars, crops, the rest are wild species. According to their origin, the species are divided into two geographical groups: American and Asian. The American group includes the following common species:

-The stem of the common bean (Phaseolus vulgaris L) is hairy or creeping. Dukkakgi has 3-5 seeds. 1000 seed weight 200-400 g. Seeds vary in color, from white to orange;

-multi-flowered (Phaseolus multiflorus Lam) has a long creeping stem, white and red flowers, large seeds. 1000 seed weight 700-1200 g;

-sharp-leaved (Phaseolus lunatus L) hairy, broad, short, flat, with 2–3 seeds in pods, rapidly cracking. The pods of the Asian species are cylindrical in shape, with no beak, with a large number of seeds, the weight of 1000 seeds is 30-60 g.

One of the species of the Asian group is the most widely cultivated-cultivated-golden bean (Phaseolus aureus Roxb) - called mung bean in Central Asia. Mung bean Phaseolus aureus is a species of bean (Phaseolus) that is a valuable food crop. Its nutritional value is determined by the high content of protein and vitamins, strong and fast digestion of calories.

G.M.Popova Ph.D. Aureus is divided into 3 subtypes:

1. s. sp. Indicus G. Pop.-pods are very slender, pods up to 7 sm long and 0.3-0.5 sm wide, the grain is small, 1000 grains weigh 15-30 g. There are medium and late ripening forms. They are mainly found in India, where the main stem of the representatives of this type of mung bean subspecies is strong and straight, and is very convenient for harvesting in a combine;

2. s. sp. Chinensis Q.Pop.-pods are large, 9-17 sm long, up to 10 mm thick, the seeds are also large. Fast cooking. Widespread in China and the Far East.

3. s.sp. iranicus G.Pop.-dukkagi is of average length, its length is 7-8 sm, weight of 1000 grains is 35-38 g. Mid-ripening is common in Central Asian countries, Afghanistan and Iran.

Mung bean is a mesophyte plant and is self-pollinating. Pollination passes without opening the flower. Flowering begins in the lower tier of the plant and goes upwards

Roots are well-developed, branched, penetrating into the soil to a depth of 0.5 m to 1.5-2.0 m (depending on care conditions). The main roots of the Mung bean are located mainly in a 30 sm layer of soil. The main and lateral roots have many pea-shaped nodules, and the bacteria in these nodules absorb free nitrogen from the air. Seed-specific nitragin bacteria are applied to the seeds before planting for better growth of the endogenous bacteria at the root.

Trunk - herbaceous, angular, many-branched, creeping or sloping, 15-120 sm tall, average 30-60 sm, well branched. The color of the stem is light green, yellowish-green, hairy and hairless, depending on the variety. The lateral branches are divided into monopodial and sympodial species growing from the leaf axils.

Monopodial (growing) branches develop from the bottom up in the stem, while sympodial (producing) branches develop from the top down. Its height in Uzbek varieties can range from 25-35 sm to 40 sm. The local Sarhad variety, imported from Pakistan, grows up to 1.5 m tall. Each bush has an average of 5-8 branches per month, and 10-12 branches when high agro-measures are taken and the number of seedlings is left in the norm. The shape of the tuber is often diffuse, making it difficult to harvest the crop using mechanisms.

Leaves – complex, triangular in shape, large, elongated, with indistinct hairs on the back. The color of the leaf is dark green, the back of the leaf is lighter green. The leaf veins pass through the center of the leaf, and these veins break down towards the tip of the leaf, branching into nets.

Flowers- is of the butterfly type and has a corolla, petals and generative organs (10 anthers and nodules). The flowers are bisexual, composed of butterfly-shaped petals. The petals have 5 petals, which come in different shapes. The largest of the flower petals is called the stalk, the two smaller wings on the side and the two lower ones that grow together with the lower edge are called the boat. There are 10 pollinators, nine of which are connected and the tenth grows freely.

Fruit- after the flowers are pollinated, its bud grows and turns into a fruit. The fruit is called dukkak. The fruit contains seeds in a short band, and when the grain is ripe, the seeds scatter along the length of the pod. Pod elongated, cylindrical, straight or curved, slender, without beak, buoy reaches 5-18 sm and has 7-15 grains 3-6 mm in size. Pod consists of two stages, in which there are one to several seeds. The ripe pods are brown, almost black, hanging, chattering when ripe. The plant is completely covered with hairs.

Seed- placed inside the pod. The size of the seeds is small compared to beans, soybeans and peas (2-2.5 times), small, oval, the ends are cut or round, green, yellow, brown, black, shiny or spotty. In cultivated varieties the weight of 1000 seeds is 50-80 g.

Mung bean is light-loving, heat-loving, resistant to soil drought. The temperature should be at least 12-15 degrees for the seeds to germinate. Seedlings and adult plant are very sensitive to frost, -10 C frost can destroy it. On the contrary, the scorching heat creates favorable conditions for normal flowering and harvesting of the plant.

The temperature is 18-22 degrees for mung bean development, and 20-25 degrees during the flowering and flowering phases. Also, the mung bean plant is resistant to changes in hot weather during the day and cool weather at night. Such conditions occur in the second half of summer, when they are grown in a mung bean (a place free of wheat or barley). The sum of useful temperatures for early ripening varieties of mung bean is 1800°, for medium ripening varieties 2000°. Flowering lasts for 15-20 days when planted in spring, and when grown as a secondary crop, the flowering period is slightly shortened.

Mung bean's demand for moisture is moderate. For full germination, the seeds absorb moisture around 120-150 percent of their weight. Mung bean grows in all areas except swamps and soils near groundwater.

Mung bean seeds germinate quickly, requiring 90-92% water relative to the dry weight of the seed. Mung bean seedlings germinate on the fourth day after planting. Mung bean is heat-resistant, but if moisture escapes from the soil, it affects the development and productivity of the plant. Excessive moisture in the soil is also not useful. Otherwise the maturation of the seeds will be delayed and it will become more unfit for storage.

According to the researchers [81], mung bean is more resistant to salt due to its ability to excrete excess salts accumulated in it. Depending on the length of the growing season, there are five types of culture: very early (60-75 days), early ripening (75-90 days), medium ripening (85-105 days), late ripening (100-115 days) and very late ripening (more than 115 days).) are divided into species. The varieties of mung bean grown in the country are mainly medium, late and very late, their growth period is 85-120 days.

However, climatic conditions (temperature, humidity) greatly affect the growth period of mung bean, which can extend the growth period to 10-20 days. Mung bean is mainly a short-day plant, and when planted in the summer, the germination and growth days of seedlings are shortened. Mung bean mainly begins to bloom in the range of 6-7 joints, the flower first rises to the top and then falls down. Before the head stem of the mung bean grows first-order horns, then second-order horns. Only the branches of its first order bloom.

Mung bean is a fertile crop. Yield varies between 2,0-2,4 t / ha when sown in April-May, taking into account soil climatic conditions, and 1,8-2,1 t / ha when sown as a secondary crop.

1.2. The importance of mung bean in the national economy

Mung bean (Phaseolus aureus PIiper. and according to the latest classification Vigna radiate(L) Wilzek) is a legume that has a high nutritional value.Today, 91.6 million tons of legumes are used as secondary crops in the world. The average grain yield is 1,2 t / ha, the gross yield is 206.4 million tons. It is the second largest cultivated area in the world after soy bean (25 million hectares). In our country, it is grown annually on more than 18-25 thousand hectares as a secondary crop.[1]

Mung bean comprises 5.3 million tons worldwide. The leading producer and consumer of mung bean is India. The sown area is 65 percent and the gross yield is 54 percent. Uzbekistan also plays an important role in the export of mung bean to the world market, exporting up to 67,000 tons of mung bean a year[2].

Mung bean has been cultivated in India since ancient times. The origin of it is South-West Asia, where it was cultivated 5-6 thousand years ago. This crop is still grown in large quantities in India, Pakistan, Afghanistan, Iran, Burma, China, Vietnam, Japan, African countries, South American countries, as well as Australia. Mung bean is grown in Uzbekistan, Turkmenistan, Tajikistan, the Caucasus and South Kazakhstan (in a small area) as a main crop or as a secondary crop after winter wheat.

Legumes have their own history in agriculture. Legumes have been used as food since ancient times. In Central Africa and America, beans, mung bean, and green peas were widely used in Central Asia. China, India, Japan and other East Asian countries were the first to use legumes. Later, these crops spread to European countries through Iran and Egypt.

The Latin name of mung bean is Phaseolus aureus in all scientific sources.

V.N Stepanov [95], P.P Vavilov and others [17], S.M Mustafoev [67] called the bean "golden bean", emphasizing that it is very resistant to drought, can be grown for grain and siderate fertilizers. passed

[1] http://www. uz.denemetr.com.

[2] https://nuz.uz/ekonomika-i-finansy/

Q.Z.Zokirov and H.A.Jamalkhanov [39] called mung bean "Asian bean", G.V.Bodner and G.T.Lavrinenko [15] called it "Asian goose". H.N. Atabaeva [6] called the mung bean "Asian beans". Apparently, the name of the mung bean is named differently in different sources. Nevertheless, its Latin name is uniformly accepted as Phaseolus aureus.

Mung bean seeds are used for food. The grain contains a large amount of valuable protein (24-28%), nitrogen-free extracts, fats (1-2%), klechatka (4-6%), sugar, fat (2-4%), starch (46- 50%), ascorbic acid, thiamine, provitamin A, E and K drugs, B vitamins, nicotinic and pantothenic acids, cytosterols, stipmasterin, flavonoids, leukoanthocyanins, vitexin, isovitexin, organic acids (apple, lemon and malone), lysine, contains macro-microelements and phosphorus salts such as arginine, Mg, Ca, S, Na, Fe, Ma, Cu, B, Co, Ni, I. The digestibility of the protein in mung bean reaches 86%. Mung bean grain is 1.5-2 times more nutritious than wheat, beans, peas, green peas and rye grains, and 1.5 times more nutritious.

Mung bean is widely used in a number of countries as a medicinal plant and cosmetic. It is widely used in Chinese folk medicine as a medicinal medicine. It is consumed as a calming of the nervous system, stopping diarrhea and quenching thirst in hot weather. Mung bean porridge has a positive effect on liver and kidney function, the seed coat is used in the treatment of eye diseases. Flour made from the seeds is used in the treatment of burns and injured areas.

It also has mung bean-antioxidant and antiseptic properties and is used as a means of reducing various colds and fevers, soothing, softening, smoothing and binding the face. Mung bean has the following therapeutic and beneficial properties: in case of metabolic disorders; gastritis; in atherosclerosis; when the rhythm of the heartbeat is disturbed; in disorders of salt metabolism; in kidney and bladder disease; in rheumatism; in cleansing and detoxification of the body, in asthma, arthritis and other diseases; has cooling properties in people suffering from high levels of internal heat.

Mung bean is also widely used in cosmetology. Mung bean is an excellent conditioner for facial skin and hair. Mung bean is used for smoothing faces, maintaining blood balance, improving body and facial skin tone, and maintaining water-salt balance due to its antioxidant smoothing and nourishing properties.

It nourishes the skin with protein and minerals, has a softening effect and eliminates wrinkles on the face. Powder made from mung bean flour is used for colds. Normalizes facial skin oils by shrinking facial pores.

Mung beankichiri

Mung bean noodle

Vegetable-mung bean salad

Fruit-mung bean salad

Mung bean cutlet

Mung bean candy

Mung bean is a fast-digesting and healthy food as well as a very nutritious dietary product. Its presence of fast-digesting protein provides the body with large amounts of iron, protein, minerals and group B drugs. It contains a small amount of fat. It is also used to cleanse the body of various harmful substances and to regenerate tissues. Mung bean has a faster digestion property than many other legumes. Has the effect of slightly cooling the human body. A 100 g grain of mung bean has a capacity of 105 kg / kl.

Mung bean is used to make a variety of dishes and pastries in Asian countries (China, Japan, Korea, Pakistan, India and Thailand). For example, mung bean cake, mung bean candy, cutlets, and various salads are made from mung bean grain. A special type of lagmon made of mung bean starch - "glass lagmon" is widely used.

In the pasta and confectionery industry, the addition of 30% of Mung bean flour significantly improves the quality.

According to medical experts, the daily protein requirement of a middle-aged person is around 70-80 grams. It is known that protein has many functions in the body plays a special role in the performance, improving the work of hormones, the activity of enzymes. Therefore, it is possible to know how important the protein is in the composition of food.

Mung bean is planted in fields set aside for fodder, vegetables, cereals. It is a good past crop for many crops, including corn, fall cereals, potatoes, vegetable crops, and cotton. Mung bean is also grown as a siderate crop.

Mung bean is also of great importance as fodder. Mung bean pie contains an average of 15% protein. If mung bean is grown in the field as a siderate, it can produce 6,0-8,0 t / ha of hay or 20,0-25,0 t / ha of blue mass [6]. The amount of digestible protein in the blue mass is two to three times higher than in the leaf of the corn and its stem. Silage made by mixing corn with mung bean is characterized by high nutritional quality.

In addition to creating a food base, mung bean plays an important role in increasing soil fertility with its organic residues, as well as in creating a fodder base for livestock. Growing mung bean as a primary and secondary crop helps to diversify crops and generate income in the short term. The development of the mung bean processing industry has the potential to focus on the local market and export potential to increase farmers ’incomes and the well-being of the population.

1.3. The importance of agro-technical measures in the cultivation of mung bean and their role in increasing soil fertility

In recent years, the risk associated with limited land resources and low quality content has been steadily increasing. In the context of Central Asia, land is a priceless gift of Allah. He literally feeds and clothes people. All the inhabitants of the republic, enjoying its blessings, create a material basis for a prosperous life.

By the years of independence, the cotton monopoly had risen to a high level. This has led to the weakening of the soil, a decrease in soil fertility, deterioration of its water-physical properties, an increase in processes such as soil degradation and drying. High levels of inorganic mineral fertilizers, herbicides and pesticides in Uzbekistan have led to soil contamination with various harmful substances.

The role of legumes in increasing the fertility of such lands and improving the agrophysical and microbiological properties of the soil is great. When legumes are planted in the field of cotton and other crops, they enrich the soil with organic matter and create an additional nutrient base. This is because legumes leave 3-4 tons and more of organic matter per hectare of land during the fall, winter and spring seasons as root and seed residues. At the same time in early spring it is possible to get 400-500 quintals of fodder per hectare for livestock.

The science of academicians D.N.Pryanishnikov and V.R.Williams is of great importance for the development of the theory of efficiency of leguminous crops.

D.N.Pryanishnikov, working on the huge problems of agrochemistry, proved that green fertilizers also play an important role in increasing crop yields. In Central Asian conditions, interest in green manure arose with the development of cotton growing.

V.R. Williams argues that the main force influencing soil fertility is the structure of the soil. According to him, although the root part of annual plants develops mainly in different layers of soil, the root does not develop widely in the drive part of the soil. The surface-forming mass of the soil is low, so it does not produce enough humus, resulting in a negative impact on the structure of the soil. He therefore recommends planting these crops in a mixture with legumes and cereals that have a strong poplar root system. When this is done, the roots on the surface of the soil penetrate into all parts of the soil, and when they dry out and rot, humus is formed in the soil. From the resulting humus, soil particles are fed and absorbed, resulting in an increase in the number of granular particles in the soil. In addition, the vigorous roots of legumes penetrate into the deeper layers of the soil, helping to transport calcium and other elements from there to the top of the soil. As a result, calcium reacts with other elements in the upper part of the soil, further strengthening the soil particles. He believes that this will greatly help to protect the soil from the effects of water erosion in the future.

According to R.O. Oripov [79], the main phenogenic in increasing soil fertility are microbiological processes that occur throughout the year in the soil. Therefore, in order for the microbiological processes in the soil to continue throughout the year, it is necessary to increase their species, number, biodiversity in crop rotation systems. That is, in crop rotation systems, it is necessary to introduce large-scale introduction of cereals and legumes as a secondary crop in winter wheat.

In the researches of L.A. Spijevskaya, M. Tojiev [93] cereals and legumes compact the soil less than alfalfa, their small roots rot during the growth of the plant and increase the organic matter in the soil, improve the water-physical condition of the soil observed.

Similar views were echoed by the Austrian scientist K. Binder [138], who considered replanting to be one of the important factors for the intensification of agriculture. They are not only additional and inexpensive food plants, he says, but rather they improve soil structure, increase fertility, and lead to an increase in cereals in rotation.

Based on the above considerations, it can be said that the use of cereals in crop rotation is one of the main conditions for maintaining and increasing the soil fertility of irrigated lands. prevents loss and salinization and prevents premature drying of soil moisture. Such results, of course, can be achieved only when the agricultural crops included in the system of crop rotation, regardless of how the crops are planted (primary crop, secondary crop,) are properly arranged.

When mung bean is grown as a secondary crop in winter wheat, it is possible to get grain twice a year, 6,0-7,0 t / ha from winter wheat, and 1,5-2,0 t / ha from mung bean, which is grown as a second crop. ts / e. As a result, the efficiency of 1 hectare will increase by 100% and net income will increase by 30-40%. The level of profitability will increase by 20-25% and the cost of production will decrease by 15-20%.

This, in turn, will ensure the maintenance and increase of soil fertility of farms, more fully meet the needs of the population in food and fodder products, increase the income and welfare of the rural population.

Harvesting 2-3 times a year increases the productivity of irrigated lands by 2-2.5 times, while leaving a large amount of root and stalk residues in the soil, which increases soil fertility and the yield of subsequent crops.

With the help of bacteria located at the root of the mung bean, it accumulates 50-100 kg of atmospheric nitrogen per hectare. Most of the accumulated nitrogen is excreted with the crop, remaining in the soil without organic matter with 25-40% of manure residues. Part of it is lost during denitrification.

According to the results of experiments conducted at the Namangan Research and Experimental Station of the Grain and Legume Research Institute, an average of 1,47 t / ha of grain was obtained from re-sown mung bean in the grain-free areas. In addition, an average of 4.4 tons of dung and root remains per hectare were preserved in the area planted with mung bean. Also, due to the decay of the residual organic mass, 53 kg of nitrogen, 19 kg of phosphorus and 13 kg of potassium per hectare remain in the soil. When legumes are planted as a secondary crop, they not only provide themselves with nitrogen during the growing season, but also leave 90-100 kg of pure nitrogen in the roots, creating favorable conditions for the survival of soil microorganisms [74].

One of the only issues in increasing soil fertility is the problem of humus formation in this soil. Humus is the most important element of the biosphere and serves to synthesize and increase the amount of biomass in the soil. The increase in the amount of humus in the soil, of course, depends on the amount of organic residue remaining in the soil.

According to many years of experiments on cereals and legumes at the Rotamsted experimental station, the amount of humus and nitrogen in the soil did not decrease in the variants in which these crops were grown due to the organic residues left by these plants during and after the application period.

This means that in agriculture, especially in increasing soil fertility, the creation of crop rotation systems creates great opportunities for the selection of crops that leave as much organic residue on the ground, placing them in order, the correct organization of work.

Efficient use of available irrigated land, harvesting twice a year, in particular, planting more than 30 varieties of winter wheat as a secondary crop, from which it is possible to grow grain, nutritious fodder for livestock. In addition, secondary crops increase the yield and quality of crops planted after them by improving soil fertility.

In 1907-1911, Russian scientist MM Bushuev used green fertilizers in cotton growing and tested them in Mirzachul field experiment. The scientist first planted a mung bean in a cotton field, drove all the mass he had collected into the ground, and then planted the seeds. As a result, cotton yield increased to 80%.

In the barren soils of Kashkadarya region, 4.76 t / ha of barley was harvested from the Bolgali variety of barley, and 1.60 t / ha was harvested from mung bean, twice a year, ie 6.36 t / ha.

According to Z.S Tursunkhodjaev [99], the cultivation of legumes in light gray soils leads to early maturation of cotton and high yields.

According to F. Yusupov [132], after the expulsion of fodder crops into the soil, the process of nitrification in the soil intensifies, and the amount of nitrate nitrogen during the same harvest of cotton is 15.6-26.4 mg / kg.

When legumes are sown in winter wheat, the amount of humus in the 0-30 sm layer of the soil increases by 0.034% and the amount of nitrogen by 0.011% compared to the initial amount [117].

World research on the use of replanting in crop rotation systems and increasing soil fertility has yielded the following scientific results: The amount of nutrients returned to the soil through the organic residues of replanted crops has been determined (United State Agricultural Department, Cotton Research Institute CRI); replanted crops have been intensified into agriculture, and technologies for growing additional and inexpensive food crops have been developed (Australian Cotton Research Institute, Cotton Research and Application Center); the cultivation of cereals and legumes has resulted in an increase in soil structure and fertility (Indian Central Institute for Cotton Research).

A number of scientific studies have been conducted to study the role of secondary crops in increasing soil fertility and the impact on subsequent crops in different soil conditions of the country.

According to scientific sources, mung bean is a secondary crop

When grown in winter wheat, 30.0-40.0 t / ha of green mass is harvested and plowed into the ground, enriching each hectare of land with 100 kg of pure nitrogen and organic matter equal to the annual norm of decomposed manure. Mung bean leaves 2.5–3 tons of root and root remnants in the soil during the entire growing season [10; 36; 73; 74; 108; 110; 112].

One of the basic laws of farming is that the law of returning nutrients to the soil cannot be bypassed. Therefore, it is possible to maintain and increase soil fertility by expanding the sown areas of legumes. Bacteria accumulate in the roots of legumes, assimilate free molecular nitrogen in the atmosphere, and biologically leave 50-100 kg, sometimes about 150 kg of nitrogen in the soil. A single mung bean helps to assimilate difficult-to-dissolve phosphorus compounds in the soil, leaving 2.5-4.0 tons of root residue in the soil during the entire growing season.

As a result of the cultivation of mung bean as a secondary crop after winter wheat, the agrophysical and agrochemical properties of the soil change for the better, increasing the amount of humus, total nitrogen and total phosphorus in it [145].

In the conditions of the meadow soils of the Fergana region in the short-term crop rotation systems after the autumn wheat was taken 1.8-1.9 t / ha of grain. It has also been observed that tillage and repeated crop cultivation after winter wheat in the short-rotation crop rotation system improves soil agrophysical properties and soil fertility, while yields have increased compared to other options [125].

Mung bean is the best siderate crop. When it is used as a green manure, 7.0 t / ha of dry matter accumulates in the soil. This is 100 kg. means nitrogen. According to scientific analyzes, when mung bean was used as a green manure fertilizer, the cotton yield increased by 40-60 percent. It should be noted that the free nitrogen in the air depends on the mechanism of assimilation of endogenous bacteria living in the roots of legumes and the type, variety of plants, natural climatic conditions, agronomic techniques.

According to Z.Jumaev and A.Sirimov [35], in the conditions of Karakalpakstan, along with a significant increase in protein in grain and beet mung bean grown, 100 kg of pure nitrogen per hectare of soil and 20.0-30.0 t / ha of green mass per hectare of land.

In order to better express the importance of agro-technical measures in the cultivation of legumes, it is important to analyze the activity of endogenous bacteria that live in the roots and assimilate free nitrogen in the air.

L.M Doroshinsky [30] points out that feeding small amounts of nitrogen fertilizers to legumes at a young age will be effective for its further growth and development.

S.N.Vinogradsky [19] studied the assimilation of free nitrogen in the air of leguminous plants by root bacteria and the effect of agro-technical measures on their care, M.V.Fedorov [104; 105] developed the biological, physiological, and biochemical basis for the assimilation of free nitrogen in the air by endogenous bacteria living in the roots of legumes.

In the conditions of fertile soils of Kashkadarya region, when 14 kg of seeds per hectare were sown in early autumn (30.06.) At the expense of winter wheat, the number of stems per plant was on average 24, 3-4 times more than in late (15.07). detected.

If mung bean is sown after winter wheat in a timely manner under conditions of limited water supply by special technology, the grain yield will be 1.86-1.93 t / ha, and the accumulation of natural nitrogen in the soil will increase significantly [124].

F.V.Turchin [100; 101] studied the role of biological and mineral nitrogen in agricultural practice and scientifically and practically substantiated that biological nitrogen is a nitrogen-biological nitrogen accumulated by endogenous bacteria that live in the roots of legumes and assimilate nitrogen from the air.

Once the bacteria enter the roots of legumes, they undergo a series of changes, initially in the form of rods, and then form bacteroids, which absorb free nitrogen from the air and begin to accumulate in the roots of legumes [64].

The protein, vitamins, and other compounds synthesized in the endogenous bacteria that live in the roots of the mung bean are of significantly higher quality than those formed by the mineral nitrogen. In addition, bacteria that live in the roots of legumes and assimilate free nitrogen from the air can also synthesize physiologically active substances and vitamins. [57; 89].

Ukrainian scientist F.F. Yukhimchuk [133] also points out that legume-grain plants depend on the acceleration and increase of nitrogen absorption in the air during the flowering, buds and legumes are well developed, and therefore on the timing and norms of planting. When agrotechnical rules are fully followed in the care of legumes, the activity of enzymes in them is high and nitrogen uptake is accelerated [14]. Thus, the activity of endogenous bacteria that live in the roots of legumes and absorb free nitrogen from the air is closely related to the life of the host plant. Depending on the correct setting of planting dates and standards.

At present, after the harvest of autumn cereals in the middle of summer, a lot of scientific and practical work has been done on the cultivation of secondary crops and the production of abundant and high-quality crops. However, there are not enough scientific sources on the cultivation of mung bean and other crops that increase the fertility of the soil as a secondary crop.

Important work is being done to determine the amount of root and stem residues left in the soil as a result of planting legumes and the effect on subsequent crops, to study the effectiveness of growing mung bean in the stalks of autumn cereals. In these scientific studies, it has been proved that if the mung bean is planted as a repeat crop to the winter wheat husk at an early stage and at the normal seedling, a grain yield of 1.7-1.9 t / ha thickness can be obtained from the mung bean [36; 44; 49; 75; 86].

M.T. Kogay [52] studied the legumes, including mung bean, by increasing soil fertility and having a positive effect on the next crop.

At the end of the growing season, winter wheat leaves an average of 1.41 t / ha of seed residues and 2.40 t / ha of root residues, while repeat crop mung bean leaves 0.80 t / ha of root residues and 1.36 t / ha of root residues. After leguminous crops planted in the field, the field germination, yield and grain quality of winter wheat seeds increase significantly relative to control (wheat + wheat) [114].

In the conditions of gray soils of Andijan region [37], the quality of cotton planted after mung bean was better than all variants, with fiber length 33.2 mm, fiber yield 36.4% and micronaire 4.6. These figures were 0.02 mm and 0.03% higher than the control variant.

G.K.Lgov [69] managed to not only increase crop yields by intensifying crop rotation in Azerbaijan, but also to prevent a decrease in soil fertility under the influence of legumes.

Since irrigated lands are the main source of demand, it is scientifically and practically justified by scientists that the main way to use them efficiently is to cultivate them several times a year using them continuously throughout the year.

In particular, K. Eshmirzaev and others [129] note that it is possible to increase the efficiency of arable lands through the cultivation of secondary crops and to obtain a grain yield of 1.5-1.8 t / ha from the cultivation of mung bean in these areas.

According to the experiments conducted by N.Jumaev and E.Shermatov [36] in the conditions of Kashkadarya region, after winter wheat have managed to get, 1.53 t / ha of grain was harvested from mung bean, and next year, 0.48 t / ha of cotton was harvested from cotton.

In irrigated eroded lands, repeated sowing of soybeans and mung bean after winter wheat enriches the soil with nutrients, improves its agrophysical and agrochemical composition, increases productivity and has a positive effect on next year's cotton yield [3].

At the same time, winter wheat is harvested, plowed, replanted, 120 kg of nitrogen, 150 kg of phosphorus and 30 kg of potassium per hectare are applied from mineral fertilizers. Washing condition or soil deflation is reduced [84].

Hence, one of the promising ways to increase the efficiency of irrigated lands and soil fertility is to use the land continuously throughout the year and to use it efficiently in the cropping system several times a year.

The effect of legumes can be seen in the following cases:

-first, legumes are valuable nutrients in the blue mass and play the role of catalysts. The blue mass of legumes decomposes very quickly, accelerates the growth and reproduction of microorganisms and increases the biological activity of the soil. As a result, the mineralization of other organic residues in the soil is accelerated;

-Secondly, because the young blue mass of legumes decomposes very quickly, its root and root residues can be used as organic fertilizer.

The accumulation of humus in the soil depends on its chemical composition, organic mass, mass of carbon nitrogen, ratio of carbon to phosphate, aeration of the soil, the activity of microorganisms and other factors.

That is why T.S Maltsev states that "as a result of negligence, organic waste of plants can be wasted or used effectively by working with the essence."

Hydrocarbons play a special role in the formation of humus. Because it contains a lot of energy (especially in legumes). It also activates microbiological processes in the soil. Therefore, it is advisable to plant crops that leave more hydrocarbon compounds in the soil. Among legumes, mung bean is a crop with such a composition.

In the conditions of light gray soils of Andijan region, it is desirable to re-sow mung bean after winter wheat in order to maintain soil fertility and obtain high cotton yields. C. Bahromov, Sh. In the experience of Bahromov [10], at the same time with the grain harvest from the mung bean crop, about 2 tons of root and root remnants per hectare had a positive effect on the fertility of the topsoil. This legume yielded 69 kg of nitrogen, 48 kg of phosphorus and 59 kg of potassium per hectare. found to increase soil fertility. According to the research on post-harvest crops in the experimental field of Surkhandarya scientific-experimental station, in the system of alternate sowing 2: 1 (2 grains: 1 cotton) the soil fertility is slightly higher than in the system of 1: 2 (1 grain: 2 cotton), 1: 1 In the (grain: cotton) system, the planting of legumes after winter wheat led to an increase in soil fertility.

In addition, the sowing of legumes has increased by 0.53 t / ha compared to the control variant, 0.31 t / ha compared to the 2: 1 rotation system, and 0.44 t / ha compared to the 1: 2 sowing system. [118].

In the conditions of light gray soils of Namangan region, the average yield of grain was 1.4-1.5 t / ha when repeated sowing of winter wheat and 0.24 t / ha additional cotton was planted the following year [74].

Thus, the role of legume-grain mung bean in increasing soil fertility by providing cotton fields with additional organic matter is important.

1.4. Mung bean selection and variety classification

It is known that one of the important factors in increasing the gross yield of legumes is the sowing of their regional varieties. To date, our scientists have created several new varieties of mung beans with high yields, good biological and technological properties.

In mung bean selection, individual and mass selection are of great importance in natural hybridization, in-species and long-form hybridization, and in populations formed as a result of chemical and radiation mutagenesis. Most varieties of mung bean are created by one-time individual selection in locally or imported introduced varieties and populations. In the individual selection, the highest yielding plants in the field, resistant to fungal diseases, viral and bacterial diseases, high-stemmed, non-cracking plants are selected. The seeds of each plant are planted separately in the selection nursery, and throughout the year the offspring are studied, the seeds of the best ones are separated, and in the control nursery the initial and competitive variety testing is studied, tested and propagated. In mung beanselection, in-species hybridization is widely developed. This also applies to all interspecific hybrids. In recent years, artificial mutagenesis has been widely used in mung bean selection. As a result of selection work in Uzbekistan, Radost, Pobeda-104, Durdona, Navruz, Kahrabo, Turon, Marjon, Zilola varieties have been regionalized and included in the State Register.

There are also Tajik-1 (Tajikistan) and Sarhad (Pakistan) varieties of mung bean, Businka, Sirenovaya, Zolotistaya, Oran, Rubin and other varieties grown in Russia.

The sort "Durdona"

It was created by scientists of the "Durdona" variety of mung bean - Botanical Research Institute and was included in the State Register in 2011. Fast ripening variety (70 days). In terms of speed, there are no analogues of the variety in the country. The variety is resistant to heat and disease, suitable for cultivation in moderately saline oils.

The plant has an erect, semi-branched stem, 50-60 sm tall. At the base are formed 30 or more pods. The pods are formed at the top of the stem. There are 8-9 seeds in each pod. Weight of 1000 seeds is 60 g. The grain is dark olive in color.

The formation of pods at the top of the stem facilitates the harvesting process. The first harvest of legumes can be done 40–45 days after the emergence of weeds. The pods in the plant do not germinate in the field, so the harvest is carried out during the full ripening of the pods. The ripe pods on the plant are dark brown or black.

"Durdona" mung bean variety is re-planted in the spring in the main and in the summer in the autumn wheat field.

The intensive type variety is suitable for harvesting in a combine.

Productivity-2.10 -2.20 t / ha.

The sort "Zilola"

"Zilola" variety was created by scientists of the Scientific Research Institute of Botany and in 2008 was included in the State Register.The variety is resistant to heat and disease, suitable for cultivation in moderately saline soils. Vegetation period is 95 days.

The plant is erect, 60-65 cm tall, with 35 or more pods on the stem. 10-12 seeds are formed in each pod. Weight of 1000 seeds is 72 g. The grain is dark olive in color.

The pods are located at the top of the stem. The formation of the pods at the top of the stem facilitates the harvesting process. The first harvest of legumes can be done 60–63 days after the emergence of weeds. The pods on the plant do not rot in the field, so the harvest is carried out during the full maturation of the pods. The ripe beans on the plant are dark brown or black in color.

Mung bean's "Zilola" sort is re-planted in the spring in the main and in the summer in the autumn wheat field.

The intensive type variety is suitable for harvesting in a combine. Yield – 2.55-2.70 t / ha.

The sort "Kahrabo"

"Kahrabo" sort-is the selection variety of the Uzbek Rice Research Institute. Authors: Saltas MM, Rakhmanov A., Sirimov A. It has been included in the State Register of irrigated lands throughout the country since 2005. Botanical type - «mung bean». Growth period is 90-95 days. Plant height 70-75 sm. The number of horns is 4-6, the number of pods per plant is 50-60, the number of grains per pod is 8-10. Weight of 1000 seeds is 55-60 g. The protein content of the grain is 28-30%, the appearance of the stem is stamped, the flowers are yellow, early maturing variety.

The grain is designed to be shed, disease resistant and mechanized harvesting. Productivity. 1.8-2.0 t / ha. It is recommended to plant this new variety in the field as a main crop for grain, blue stalks and as a secondary crop after wheat.

The first harvest of legumes can be done 40–45 days after the emergence of weeds. The legumes in the plant do not germinate in the field, so the harvest is carried out during the full maturity of the legumes. The ripe pods on the plant are dark brown or black in color

The sort Turon

The Turan sort of mung bean was created by scientists of the Plant Research Institute and was included in the state register in 2012.

The variety is resistant to heat and disease, suitable for growing in moderately saline soils.

Medium ripening variety. The vegetation period is 100 days. The plant is erect, 70-75 sm tall, 40 or more pods are formed.

There are 12-14 seeds in each pod. Weight of 1000 seeds is 85 g. The grain is dark olive in color. The formation of pods at the top of the stem facilitates the harvesting process.

The first harvest of legumes can be done 65 days after the emergence of weeds. The pods on the plant do not rot in the field, so the harvest is carried out during the full ripening of the pods. The ripe beans on the plant are dark brown or black.

The intensive type variety is suitable for harvesting in a combine. Productivity is 3.0-3.2 t / ha.

The sort “Marjon”

The sort “Marjon” - was created by scientists of the Institute of Botanical Research and in 2008 was included in the state register. The variety is resistant to heat and disease, suitable for growing in moderately saline soils. It is a fast-ripening variety, the first pods ripen in 60-63 days after germination. The full cooking time is 90-95 days. The pods are formed at the top of the stem (20-25 pieces). Grain yield is 2.55-2.80 t / ha. The weight of 1000 seeds is 82 g. The grain is olive-colored, shiny.

The formation of pods at the top of the stem facilitates the harvesting process. The pods on the plant do not rot in the field, so the harvest is carried out during the full ripening of the pods.

The sort “Navruz”

“Navruz” - was created by Uzbek Rice Research Institute. Authors: Rakhmanov A., Sirimov A. Botanical type - «mung bean». A new variety of this mung bean was created by the method of individual selection. This variety can be grown mainly as a main crop for grain and green stalks, and as a secondary crop after wheat. The ripening period is 85-90 days, shortened by 10-15 days when planted in the summer, plant height is 95-100 sm. The number of flowers is 16-40, large red, pink, white and porcelain, the pods are long, 1000 seeds weigh 60-65 g, flat, elliptical, yield 2.0-2.2 t / ha. The protein content of the seeds is 22-24%.

Collected with the help of mechanization. Preparation of protein-rich fodder in animal husbandry is used on farms to increase soil fertility in agriculture. As a result of the introduction of a new variety of mung bean, it will be possible to obtain nutritious grain and green stalks, as well as to sow in the field as a secondary crop after the main and wheat.

The sort "Radost"

The "Radost" is a selection sort of the Uzbek Institute of Rice Research, created at the Institute of Botany of the former Soviet Union by the method of mixing samples 4730 x 224501. Since 1984 it has been included in the state register for planting on irrigated lands throughout the country.

The sort ripens very quickly, in 72-76 days. Tupi grows upright, height 65-70 sm. The number of flowers is 30-60, the buds have an average of 6-8 yellow flowers. The seeds are medium, green. The pods are short, the pods have 10-14 grains, the seed pods are white, the weight of 1000 grains is slightly lighter, on average 39-49 grams, the protein content in the grain is from 24.2% to 27.3%. The average yield is 1.72 t / ha.

The average growing season for mung bean Radost is 101 days in spring and 80-85 days in spring. If planted late in the summer, the growth period will be shortened. Mung bean "Radost" is more resistant to diseases, adverse conditions, especially high temperatures and lack of moisture than Pobeda-104. The first pods appear at a height of 15–17 sm from the ground. The pods are located on the third part of the branches. It is convenient to harvest this variety with the help of combines.

The sort "Pobeda-104"

The variety "Pobeda-104" is a selection sort of the selection department of the former Faculty of Economics of Tashkent State University, created by selection from the Chinese sample of the collection of the Institute of Botany of the former Soviet Union. Since 1984 it has been included in the state register for planting on irrigated lands throughout the country.

The stem grows straight, 30-50 sm in height, the side branches hang down. The leaves are large, the flowers are large, golden yellow, the number of flowers is 2-12. The pods is long, cylindrical, smooth 4-10 seeds, the tip sharpened. The seeds are large, glossy, cylindrical, light green in color, weighing 50–60 g per 1000 seeds.

This variety ripens early, in 90-100 days when sown in spring, in 75-90 days when sown as a repeat crop. The protein content is 23.3%, the grain cooks well when boiled. Resistant to disease and pests. Yields average 1.8-1.9 t / ha.

The sort “VIR-628”

Mung bean's “VIR-628” variety was created by the Central Asian Experimental Station using the general selection method from among the VIR collections. The tuft grows into a bush. The flowers are golden yellow. Each inflorescence has 6-8 flowers. The pods is short, 8-10 sm long. The seeds are small, bright green, weighing 45-50 g per 1000 seeds. The grain cooks well. The protein content of the seeds is 22-30%, the amount of lysine is 5 and arginine is 8%, ash is 3.2-4%. It is a relatively fast-growing variety, the growing period is 85-100 days. It is also planted in the fields for the purpose of preparing high-yielding grains and hay.

The sort-“Tadjikistan-1”

The Tajikistan-1 sort of mung bean was bred by the Tajik Agricultural Research Institute through a single selection from the VIR Manchurian Sample Collection (K-5087). The plant grows to a height of 50-70 sm. The flowers are golden, the pods are flat cylindrical, slightly hairy, the number of seeds is 8-10. The attachment height of the lower lobes is 12-15 sm.

The seeds are small, elongated, brownish-green, smooth pale, covered with a slight brown powder. The seed coat is yellow, the seed coat is brownish-green, the weight of 1000 grains is 40-43 g, the seeds are the same size, ripen uniformly, the protein content is 28%. Variety medium maturity, growth period 92-105 days, high yielding variety.

The sort -“Oltin”

The “Oltin” sort of Mung bean was grown at the Uzbek Rice Research Institute by mixing ordinary beans from the Zhytomyr region with vigna (hybrid7) and then selecting them individually. This variety can be planted to grow cereals and beets. The plant has a tree-like shape and reaches 55-60 cm. Flowers 6-10, purple. The amount of seeds in each pod is 8. The seeds are elongated, kidney-shaped, large, weighing

500 g per 1000 seeds. The grain contains 24% protein and the bean contains 14.1% protein.

It is characterized by drought tolerance. In areas where groundwater is shallow, productivity decreases.

At the Zhytomyr State Variety Testing Station, the maximum yield of Golden Variety was 29 tons per grain and 3.26 t / ha per hectare.

In this variety of mung bean, due to the fact that the lower pods are attached from the very top, it is convenient to harvest in a mechanized way.

The sort "Angelica"

"Angelica" sort was created by the Rice Research Institute of the Uzbek SSR. This variety is often derived from Indian varieties by the method of individual selection.

"Angelica" variety has great advantages over other varieties, the stem is tree-shaped, grows quickly, and the pods are located at the top of the stems. The beans do not spill or crack. The height of the joint of the lower lobes is 56 cm. The crop can be harvested by mechanisms. The taste and technological qualities of the grain are good. Forms many nodules on the roots.

The sort "C-65"

Indian selection sorts from foreign varieties are important. The University of Punjab in India has grown the S-65 variety of mung bean by the method of selecting from the local varieties of the fairy tale. It is recommended to plant instead of Puasa baysakhi variety. This variety is early maturing and is intended for cultivation in areas with short summers. In terms of productivity (13.2%) it is 38.9% superior to the standard variety in favorable conditions and 27.6% (8.1%) in unfavorable conditions.

This variety is resistant to bacterial and fungal diseases, but when it rains in the summer, its susceptibility to the virus of cypress increases. The plant is 45 sm tall, the stem grows upright. It flowers 35 days after planting. The seeds are light green, of medium size, with a protein content of 28%.

CHAPTER II. AGROTECHNOLOGY OF MUNG BEAN CULTIVATION

2.1. The role of mung bean in crop rotation

In the crop rotation system, mung bean is a good past crop. It is advisable to use mung bean as a secondary crop after cereals and vegetables, as well as a number of other crops. Mung bean increases the yield of almost all self-cultivated crops and blends well with all agricultural crops.

The Land Code of the Republic of Uzbekistan, the Law "On Farming", the Law "On Peasant Farms" and other normative acts strengthen the rights of landowners, the responsibility for the purposeful and rational use of long-term leased land and the preservation and enhancement of natural soil fertility. aimed at combating diseases and pests.

The introduction of crop rotation of cotton, alfalfa and legumes in the country plays a crucial role in the successful implementation of this important task. This is because in crop rotation, cotton is more resistant to various diseases and pests, the harvest is earlier, the stalks are loose, the fiber is long and ripe.

V.R. Williams The main component of the grassland farming system is the introduction of crop rotation consisting of a mixture of legumes and cereals, basic and pre-sowing tillage, strict adherence to agricultural techniques, systematic, proper organization of nutrition, soil moisture and its the widespread introduction of forest reserves that preserve the fertile part, the use of their selected seeds in the cultivation of agricultural crops, as well as the proper organization of land reclamation and irrigation.

The more root and root residues of legumes remain in the soil, the more effective it is on soil fertility, resulting in higher yields from the cotton that is then cultivated.

According to F.V. Turchin [100], legumes, which are planted alternately throughout the year, provide beneficial microflora in the soil. Depending on the fermentation properties of the microorganisms, nutrients that are difficult for plants to assimilate are also used.

S.A. Vorobev says that the variety of crops in crop rotation, although they leave a very small amount of organic residues left in the soil, mainly they provide the plant with the necessary nutrients. An important aspect of this process is that they have rapid microbiological decomposition, often surpassing organic fertilizers in terms of humus production. Just for this, enough biomass must accumulate in the soil.

Given the need to include in the short-term rotation system of cotton and grain, which is widely used in production to maintain and increase soil fertility on farms, it is necessary to introduce new crop rotation systems that leave as much organic residue in the soil and restore soil fertility. improvement is required by the introduction of repeat crops of the species.

It is known that legumes, especially mung bean, are of great importance among secondary crops. With the planting of legumes as a secondary crop, a number of issues will be addressed. First, increase the cultivation of cereals. The second is to solve the problem of plant protein and the third is to increase soil fertility. Along with meeting the demand for winter wheat, legumes and cereals will meet the needs of the population in grain products, and grain production will be increased. In solving the problem of plant protein, mung bean has an advantage in terms of protein content in the grain. Its grain contains 24-28% protein, which is 2-3 times more than grain crops.

Abundant and high-quality harvest from such important crops as winter wheat and cotton depends in many respects on soil fertility. One of the main factors in increasing soil fertility is the rotation or rotation of agricultural crops. In practice, alfalfa and corn are used more in the rotation system, and soybeans, peas, sunflowers, mung bean, melons and other crops are used in rotation.

Studies show that the water-physical condition of the soil improves at the expense of the root and root mass left in the soil after repeated crops. It is also characterized by the ability to accumulate nitrogen using tubers of different shapes and sizes, which develop in the root system.

As a result of repeated cultivation of legumes in crop rotation systems, not only the restoration and increase of soil fertility at the expense of organic residues, but also a positive effect on the water and water-physical properties of the soil [116].

Depending on the type of crop, the roots and stalks left in the soil depend on the type of crop, and when soybeans and mung bean are planted as winter wheat and then as a secondary crop, an average of 4.5-5 tons of roots and stalks remain per hectare per year [73.].

According to M. Tojiev, K. Tojiev [97], the amount of humus and nutrients in the soil increases as a result of repeated crops planted after winter wheat, leaving the remains of roots, stems, leaves, stems and green mass in the soil. This in turn increases soil moisture and water permeability.Mung bean also not only improves soil fertility, but also increases the amount of protein in the grain, the amount of sugar in sugar beets.

No separate land is required for crop rotation of legumes. Therefore, one of the internal opportunities for the use of irrigated lands is the organization of large-scale cultivation of legumes, especially sorghum, among the secondary crops. It is possible to get the crop by cultivating early-maturing varieties of the crop, which are planted among the secondary crops. In accordance with the rules of agronomic techniques, in particular, the preparation of land for planting, timing and rate of sowing, timely feeding with irrigation and mineral fertilizers, inter-row cultivation and timely harvesting are carried out on the basis of recommendations developed by industry experts. the desired goal can be achieved.

Indeed, as mentioned above, a number of issues can be resolved through the cultivation of legumes, taking full advantage of their potential.

2.2. Planting and cultivation of mung bean

Mung beans give good yields in a variety of ecological and soil-climatic conditions. It can also be grown in low-yielding soils, but it cannot be grown in swampy (saxaul) soils.

To plant a crop, you must first prepare the soil for planting. Mung bean is mainly planted in spring and summer.

Plowing is carried out in the fall to prepare the field for planting the main (spring) mung. The yield of late autumn plowing is lower than that of early plowing. If the autumn plowing is carried out in a timely manner, a lot of moisture will accumulate in the fall, microbiological, physicochemical processes in the soil will be activated, and conditions will be created for the accumulation of easily digestible nutrients.

Pre-sowing tillage begins with early spring storming of the planting area. This event is held in order to retain soil moisture and control weeds. According to scientific data, soil moisture in stormy soils evaporates 15-19 times slower than in non-stormy soils. Up to 40 m^3 of water evaporates per day from the non-irrigated area. Each cubic meter of water stored allows to obtain a grain yield of up to 1 kg, respectively. It is often stormed twice and the break at once.

The next stage of soil preparation is to loosen the soil. The first cultivation is carried out 4–5 days after the storm, the second before planting. During each cultivation, a storm is also suppressed. The main purpose of this event is to soften the soil layer in which the seeds are put.

For replanting **(in the summer)** mung bean, the field should be irrigated with a loosening of the previous crop. Depending on the maturity of the soil, the furrow is loosened to a surface of 5–6 sm. In weedy fields, the soil is loosened to a depth of 12-14 sm. Softening the surface of the soil accelerates the germination of weeds, which then makes the plowing much easier and creates the conditions for its quality performance. Tillage mitigation is only effective if it is carried out simultaneously with or after the harvest of the main crop. Delaying the surface softening of the soil causes a lot of moisture to evaporate from the surface and bottom layers of the soil.

Ground driving should be carried out at the time of the bar with a harrow at a depth of 18–20 sm, on a plow. In doing so, it ensures good burial of seeds and manure remnants, eliminates annual and perennial weeds. Or the lands are irrigated 7-10 days before the grain harvest.

In this case, as soon as the autumn grain crops are harvested, plowing can begin.

Fertilization. Mung bean is very sensitive to mineral and organic fertilizers applied to the soil. These fertilizers not only increase yields but also improve seed quality. It is especially effective to use phosphorus-nitrogen fertilizers for mung bean. Nitrogen in mixed fertilizers has a positive effect on plant growth and development. In particular, phosphorus fertilizers should be applied before planting, as phosphorus must remain in the soil for some time to affect the plant.

Before plowing the field in the fall for the main (**spring**) planting of mung bean is applied phosphorus and 20–40 kg of potassium fertilizers per hectare at the rate of 40–60 kg of pure substance. Nitrogen fertilizers can be applied before planting and during the growing season, the norm is 20–30 kg. During the flowering and flowering period, 20–30 kg of phosphorus and 10–20 kg of potassium are added.

During repeated (summer) tillage, 40-60 kg of phosphorus, 20-40 kg of potassium and 20-30 kg of nitrogen fertilizers are applied per hectare. During flowering and flowering, 20-30 kg of nitrogen, 20-30 kg of phosphorus and 10-20 kg of potassium are added.

If the norm of nitrogen fertilizer is exceeded, biological nitrogen is not assimilated.

There are micronutrients in the growth and development of mung bean, manganese, molebdin, zinc, copper and others are also effective.

When there is not enough in the soil, the growth and development of the plant is disrupted, productivity decreases. When the leaves turn yellow (chlorosis occurs), the process of iodosynthesis is disrupted and the yield can be reduced by 10-40%. Micro-fertilizers are applied at the rate of 0.4-0.5 kg per hectare in pure form.

When manganese deficiency is felt in the soil, chlorosis and necrosis of the plant occur. Manganese fertilizers are applied at the rate of 2-3 quintals per hectare during cultivation. If there is a shortage of molybdenum in the soil planted with mung bean, the crop lags behind in growth, endogenous bacteria do not develop and productivity decreases. Molybdenum (in melted state) at a rate of 2-4 kg per hectare increases crop yields. This increases the storage of molybdenum in the seeds and the amount of molybdenum in plant stems, calcium in the leaves and roots, phosphorus content in the leaves. The higher the molybdenum dose, the higher the yield. For example, the additional yield of molybdenum at 50 g per hectare was 17.9%, at 100 g at 21.1 and at 200 g at 63.1% [81].

Application of zinc fertilizers on carbonate soils increases the yield by 20-30%. The dose of these fertilizers is only a few grams per hectare. In recent years, observations in India have shown that when zinc fertilizer is applied, in addition to increasing the yield, the amount of dead bacteria has also increased.

Mung beans thrive only when there are no bacteria in the soil. Accordingly, in areas where mung bean is planted for the first time, nitragin should be applied to it in order for rapid growth of endogenous bacteria around the plant root.

The use of industrial wastes is also important in increasing the yield and improving its quality, as these wastes contain many trace elements (0.03% manganese, 1% magnesium, 1-5 iron, 0.3% zinc, around 1% aluminum, etc.). will be. Application of industrial waste at the rate of 3 ts per hectare before planting will increase the yield of green beans to 20-23.7 ts / ha, grain yield to 4.9-5.8 ts / ha. The use of industrial waste as fertilizer not only increases productivity, but also reduces the cost of production per quintal by 23.4%.

Preparation of seeds for sowing. Only if quality seeds are sown, the intended yield can be obtained. Seed quality and yield characteristics are affected by seed size, specific gravity, shape. Therefore, when preparing seeds for sowing, it is only necessary to select seeds of heavy, medium and large fractions. Large seeds not only germinate quickly and evenly, but also contain large amounts of protein.

Seeds are treated with bacterial, growth agents, antibiotics and acids before sowing. It is much easier to work with growing substances before sowing seeds than during the growing season. The seeds are also irradiated before sowing.

When preparing seeds for planting, it is very important to treat them with chemicals. Mung bean and other leguminous seeds are treated before sowing for the following purposes: from diseases that can be transmitted through the seeds (root rot, ascites), deterioration of seed quality, protection of sown seeds and their seedlings from soil mold, reducing seedling damage from soil insects, seed germination and field increase greenery, enhance their growth and development with growth substances.

In the treatment of mung bean seeds are treated with the following drugs:

TMTD (symbiotic drug) contains 80% TMTD, 0.5% OP-7 and an adhesive (sulfide-alcohol bar), the rest consists of kaolin. Used to protect seeds and seedlings from diseases such as mold, ascites. It also accelerates the growth of seedlings. You have to be very careful when working with TMTD. Each ton of seeds consumes 3-4 kg or 2.4-3.2 kg of pure drug.

Fentiuram is a complex drug that contains 40% TMTD, 10% TXFM, and 15% gamma isomers of GXTsG. It is used as a fungicide to protect the seeds from mold in the soil, root rot and bacterial pathogens, as well as various insects in the soil. Its use rate is 4-6 kg per 1 ton of seeds or 2.6-3.9 kg in pure form.

Fentiuram-molybdate. This complex drug is used to feed plants with micronutrients (4% molybdate) and to protect them from various diseases. The norm is the same as fentiuramniki

Titam is a complex drug containing 50% TMTD and 20% gamma isomer of GXTsG. Toxicity is moderate. In medicine, 4-6 kg per ton of seeds or 2.8-4.2 kg of pure substance is used.

All of the above drugs consist of a moisturizing powder. Seeds treated with bacterial fertilizers should be treated with TMTD group drugs 20-30 days before bacterization.

Planting. The purity and purity of the cleaned and sorted seeds of mung bean should not be less than 98.5%, and the germination rate should not be less than 92%. Mung bean is planted in spring and summer.

Mung bean begins to be planted as the main crop (in the spring) when the soil warms up to 12–140 and the risk of frostbite disappears. The first half of April in the southern regions of Uzbekistan and the second half of April in the northern regions are the best time to plant mung bean. Mung bean also sprouts well when planted in May.

In the Tashkent region, the highest yields were obtained when sowing mung bean on May 5 and 25 in experiments conducted on meadow soils with shallow groundwater.

The time of re-sowing of mung bean (in the summer season) falls on the third decade of June and the first ten days of July. If planted later, the grain yield decreases sharply and is exposed to the first frost.

Mung bean is planted on ordinary grain drills, SON-2,8 disc drills, Romanian pneumatic drills SPCh-6M, SPCh-8A, SZ-3.6, SZP-3.6 or vegetable drills 3-4 sm, if the soil dry 5-6 to a depth of cm.

Planting method and norm. Mung bean is planted in wide rows or in double rows in the ribbon method, with row spacing of 60-70 sm and double row spacing of 15-20 sm. The sowing norm is on average 10-16 kg / ha depending on the navigation. If planted in two rows at a spacing of 90 sm, the plant spacing is 15 sm and the sowing rate is 20-30 kg / ha.

In the meadow soils of Tashkent region, the highest yield was 13 kg per hectare. Increasing the seedling thickness by this amount reduced the grain yield by 10.5-17.6%.

For fodder and green manure, local varieties of Mung bean are planted in rows, 50-60 kg of seeds per hectare. In this way the mung bean can be sown until August, they are watered 4–5 times

Mung bean can also be planted in an uncultivated area in an unconventional way. In the practice of harvesting twice a year, the time for sowing the second crop and the period of harvesting the ripe crop will be limited. A planting system in an uncultivated area alleviates the problem of limited time and maintains the moisture level present in the soil, reducing moisture escape, soil erosion and evaporation. The use of herbicides and the efficient use of plant residues in the mung bean planting system on uncultivated land increase the chances of growing crops twice a season.

Figure 2.2.1. Mung bean planted in rows as a secondary crop

In this case: - Two types of crops are grown at the expense of fuel consumed for one type of crop, which is traditionally grown;

- gross output will increase, while total production costs will decrease;

-technical means are used more fully, labor demand is distributed equally throughout the year.

The obtained grain yield showed that the yield of mung bean planted on uncultivated land (2.24 t / ha) was significantly higher than the yield of mung bean planted conventionally (1.85 t / ha) [76].

Figure 2.2.2. Mung bean planted in bulk for green manure

Figure 2.2.3. Mung bean planted on uncultivated land

In the same planting season, it is possible to save money on machinery and fuel, and after plowing the grain, without plowing the straw-stemmed soil, it is possible to sow the mung bean by lightly watering it and chiseling the field as soon as it is ripe. In this way, along with saving both time and fuel and machinery, the ability of winter wheat to retain moisture increases due to the fact that the poplar roots are located in the driving layer of the soil and cover it, reducing the transpiration coefficient on the soil surface. As a result of the activation of root and root rot in the soil due to moisture, water-air exchange in the plant, the supply of nutrients is improved, the porosity of the soil increases.

There are a number of advantages to planting straw under the ground:

-first, it has a positive effect on the respiration of the root of the mung bean by porosity of the driving layer of the soil, the activation of plant absorption of nutrients as a result of the proliferation of roots under the soil, the accumulation of more free nitrogen;

-Secondly, on the same hot days of summer, when these lands are irrigated with straw, carbon dioxide is formed as a result of activation of various microbiological processes, which increases the productivity of photosynthesis. The annual rate of application of mineral fertilizers is reduced, as well as the carbonic acid formed under the soil neutralizes the soil environment, reduces its salinity, has a positive effect on increasing productivity;

-thirdly, the presence of straw residues in the drive layer of the soil serves as a water and resource-saving vehicle, preventing moisture from escaping rapidly from its top layer.

Caring for mung bean consists of complex measures, such as weeding, watering, soil loosening, weed control, pest and disease control, and crop nutrition. Depending on the condition of the soil, the condition of the crop, the availability of water, fertilizers and other conditions, maintenance work may vary.

At the same time as planting the mung bean, the irrigation canals are also opened. Irrigation plots are obtained using a drill mounted on a drill. When planting is completed, it is watered so that the grass is harvested in a sloping manner. If enough moisture has accumulated in the soil, then the first watering is given 10–15 days after germination. After each watering, of course, the row spacing is loosened and cleared of weeds.

The first cultivation and the first weeding is done 10–12 days after germination of seedlings. The number of row spacing also depends on the field fire, which should be carried out at least 2-3 times, and stopped when the pods begin to form. When the soil is loosened, the plant's respiration process improves, and the roots absorb the nutrients in the soil better. It also intensifies the microbiological processes that take place in the soil.

The plants are cultivated a second time when they reach 10-15 sm in height. A protective zone of 6-8 sm is left on both sides of the rows so as not to cut the side roots of the plant.

Herbicides used for legumes can be used to remove weeds in a mung bean-planted field. Fuzilad super 12.5% em.k against annual and perennial weeds when removing mung bean into the soil or 2-3 leaves within 2-3 days after planting. herbicide can be applied to 0.4–0.6 liters per hectare.

In addition, 2-3 days before the emergence of seedlings are sprayed weed linuron or promethrin. Glyphosate against perennial weeds, Gezagard herbicide can be applied at a rate of 2-3 l / ha. The plant is cleaned of weeds up to 3-4 times without the use of herbicides.

The plant consumes more water during the period of flowering and seed formation. In meadow soils where groundwater is up to 1 m, it is irrigated 2 times during the growing season. In gray soils with deep groundwater, 1-2 times more water is given.

Attention should also be paid to watering the plant and in what order to irrigate. Because the root of the mung bean contains azotabacter, its root breathes oxygen. It is necessary to improve the air permeability, porosity of the soil. It is therefore necessary to irrigate it with a small amount of water, without over-watering when watering. Equipment should not be entered without grounding. As a result of the disruption of the soil structure, the soil becomes compacted, making it difficult for them to breathe. When the soil is loosened after each irrigation, the tuber is softened by the supply of oxygen to the bacteria, the distribution of nutrients to the organs is improved, a high grain yield is obtained, and a large accumulation of free nitrogen in the soil is achieved.

Mung bean harvesting is done in the morning or late afternoon when the beans are 70% ripe. This reduces grain shedding and loss. Mung bean is mainly harvested before and after harvest. Combines Niva, SKPR-4, SKD-5R can be used for harvesting. In order to harvest the grain using technical means, when the grain is 80% ripe, it is treated with Reglon-Super desiccant at the rate of 2.5 l / ha, and the crop is harvested by shedding the leaves.

The harvested crop is taken to the threshing floor, dried for 2-3 days and then crushed. Grain cleaner OS-3 is cleaned on OS machines.

After drying, the mung bean grain is stored in special warehouses in moisture-proof bags at a moisture content of 14-15%.

If mung bean is planted as a green manure, when the grain begins to run out, the roller is pressed, then discarded on both sides and plowed with a chisel to a depth of 27–30 sm.

Processing and storage of mung bean seeds. Freshly harvested and threshed mung bean grains undergo initial cleaning (organic and mineral mixtures). When cleaning mung bean grains, care should be taken to ensure that the seeds meet the requirements of the Class I-II seed standard and that the grains are not mechanically damaged.

Mung bean seeds are well cleaned from other mixtures "snake" and gorkada. The height of pouring the mung bean seed with the conveyor is reduced so that it does not damage or crumble. Flexible feathers are used to ensure that the seeds fall slowly. These types of sleeves are made of tarpaulins, bags and other materials. Also, the walking speed of the belt conveyor is reduced to 1.5-1.7 meters per second, barriers are placed on the conveyor to prevent grains from falling on the belt.

If the mung bean varieties are wet, they should be dried at a temperature that does not interfere with the quality of the seeds. Mung bean grains are dried on farm-type dryers. Grains with a moisture content of more than 19% are dried in a stratified mode. The temperature in the first layer of the drying agent is reduced to 100 ° C and to 50 ° C when the seed is heated. Its moisture content is reduced by 3-4% so that the seed coat does not crack.

If it is not necessary to dry the grain, that is, if the seeds have to be stored in high humidity (for canning dry seeds), they should be cooled. Cooling is carried out in an active and passive way with dry and cold air. In the passive method of cooling, the building where the seeds are placed is ventilated and air is sent under the floor. In the active method of cooling, the seeds are cooled using a stationary or portable ventilation device. In general, the active ventilation method of cooling is effective.

Mung bean grains ripen shortly after harvest and can germinate quickly. But if the mung bean is stored under favorable conditions, it will retain its bruising ability for 15-20 years. Therefore, the rules of grain storage should be strictly followed. When the seeds are stored in a bag in a dry building, no more than 8 bags can be stacked on top of each other.

If the warehouse is equipped with an active ventilation device and it is possible to observe the quality storage of the seed pile on the entire floor, dry seeds can be stored without spilling on the ground. In this case, the layer of the seed pile near the wall should not exceed 2.5 meters and the layer in the middle should not exceed 5 meters. Requirements for mung bean seeds (according to GOST 10251-76) are given in Table 2.2.1.

During storage, the condition of the seeds and their quality should be constantly monitored. Temperature, humidity, seed damage and germination are monitored. Good conditions during storage and its systematic monitoring ensure full preservation of the high-quality qualities of the mung bean. The concept of the quality of the seed to be sown is included in the sum of its characteristics, which characterizes how suitable the seed is for sowing. Suitability characteristics for sowing include viability, growth vigor, germination energy, and germination.

Table 2.2.1
Requirements for mung bean seeds

Class	Seed content, at least%	Seeds of foreign plants, not more than 1 kg per 1 kg		Fruitfulness, at least%	Humidity, not more than%
		All	Weed seeds		
I	99,0	10	5	95	14,0
II	98,0	50	15	92	14,0
III	96,0	100	50	90	14,0

Survival, that is, the ability to live, is the ability to cope with certain difficult conditions. Growth strength is the rapid and inconspicuous germination of seeds, rapid growth of seedlings in field conditions and long-term storage. Greening energy is the ability of a seed to germinate quickly and evenly. Seed germination is the maintenance of normal development of seed tumors. Seed moisture is the retention of hygroscopic water in the seed. A temperature of 20-250 is used to determine the germination of the seed. The bruising energy of the mung bean is determined after 3 days.

There are a few simple ways to improve seed quality: like heating with hot air and water.

Warming the seeds with warm air before sowing ensures that the seedlings germinate evenly and develop normally. It is very important to use this method for seeds with low germination. To heat the seeds in this way, the top is spread thinly on a closed threshing floor and turned over from time to time. In hot weather, heating the seeds is completed in 3-5 days, and under the hive and shed in 5-7 days.

Heating the seeds in water before sowing is one of the simplest ways to increase seed germination in field conditions. The seeds are soaked in hot water (up to +600) for 6 hours, then drained and spread in a skirt to dry. When seeds are heated in this way, germination in field conditions increases by 23-26%. In addition, the crop is also ripened 4–6 days earlier than others. Depending on weather conditions and navigation, the additional yield due to the application of this method is 14.3-44.1%. Also, heating the seeds in hot water before sowing prevents anthracnose from infecting them, as high temperatures kill the fungal mites.

2.3. Diseases and pests of mung bean and measures to fight against them

Legumes are also affected by pests and diseases. This leads to the destruction of the crop, the consumption of products, and the seeds become absolutely unfit for planting.

Pest and disease control is one of the important factors in the care of mung bean crop. Because the decrease in yield, the deterioration of quality depends in many respects on the extent to which the plant is affected by pests and diseases. In pest control, it is important to determine their type, the extent to which the plant is affected, as well as to know the biological characteristics of the pest.

In order to ensure the implementation of the Resolution of the President of the Republic of Uzbekistan dated June 1, 2017 No PQ-3027 **"On the placement of secondary crops in the vacant areas of cereals in 2017, the timely supply of material and technical resources required for the crop" [2] ,** Legumes were planted on 1,000 hectares of land. Therefore, one of the most pressing issues today is to sharply reduce the number of pests in legumes and maintain the yield in order to grow legumes and get high yields from them and meet the food needs of the population.

The Action Strategy for the Development of the Republic of Uzbekistan for 2017-2021 also sets priorities for "... development and implementation of measures to protect plants from diseases and pests."

In recent years, a number of pests have appeared in legume crops, especially mung bean, causing a sharp decline in yield. It is necessary to create opportunities to increase the yield of legumes by implementing effective methods of pest and disease control.

Like other crops, legumes are affected by pests, diseases and weeds, leading to a decline in yields and product quality. We know that 30% of the world's agricultural crops are being destroyed by pests, diseases and weeds. In areas specializing in the main legumes, specific pest fauna is formed, under the influence of which the yield can be reduced by 10 to 60%. Under the influence of pests, the generative and vegetative organs of the plant can be damaged in various ways.

In view of the above, the development of cost-effective, environmentally friendly measures to control pests and diseases of legumes is an important issue.

The study of the species composition of legume pests in Uzbekistan began in the second half of the last century, and the first information about mosquito pests can be found in the work of V.V

Yakhontov. In this case, the author provided information about 1 mite and 13 insects. From spiders, spiders, insects: 6 species of cocoons, 4 species of hard-winged, 1 species of equal-winged, semi-hard-winged and two-winged. Data on direct mosquito pests Eremenko A.P. [33] V.N Polevshchikova [82] noted in the study. V.N Polevshchikov and V.I Sorokin [82] during their research noted the presence of 24 species of pests in the mung bean. The main pests of mosquitoes are 5 species of aphids, 4 species of snails, 2 species of long-nosed mosquitoes, 1 species of mosquitoes, 5 species of nightshade.

In recent years, a number of studies have been conducted at the Botanical Research Institute and Plant Protection Research Institute on pests and diseases of mung beanes and measures to combat them [32, 68].

Root rot is caused by the fungus Thielaviopsis basicola Ferr, Pythium de Baryahum Hesse. All of these microorganisms rot and kill plants before they come to the surface, darkening and drying the roots or stems of mature plants. Sown seeds rot, colorless spots appear in the root collar of the seedlings, resembling burns in boiling water, resulting in wilting of leaves and seedlings. In the root collar of larger seedlings and young plants appear slightly sunken, reddish-brown, elongated wounds.

Disease occurs when the temperature rises and the water regime of the soil is not stable. The fungus is stored in plant debris, seeds, soil. Root rot disease causes sown crops to become sparse and yields decline.

To combat this disease, take seeds from healthy crops, thoroughly clean the seeds before sowing and use effective drugs-vitavax 200 FF, 34% s.s.k.-2.5 l / ha, protection 10% s.s.-4.0 l / ha. e, drug-4, 25-30% powder, -3.0 kg / t, blessing 60% p, should be treated with -0.4 kg / t.

Fusarium wilt is caused by fungi of the genus Fusarium oxysporum Sehleht, which, in addition to root rot, can also cause dry rot, wilting, dry rot of fruits and seeds. Under the influence of this disease the plant grows very slowly. When the plant is examined, it can be seen that part of the stem above the main root and rhizome is reddened. The root cracks along the length and the root dries. The main source of infection is plant debris and seeds. The damage of the disease increases when there is a lack of moisture in the soil. Seed mold is observed in years of excess moisture, which leads to poor seed development and deterioration of quality.

To prevent the plant from contracting these diseases, sow high-

quality healthy, selected seeds, effective seeds from vitavax 200 FF, 34% s.s.k.-2.5 l / ha, protection 10% s.s.-4.0 l / ha, medicinal 4, 25-30% powder, seed spraying at the recommended rates of -3.0 kg / t, sowing in a short time, adherence to agronomic rules, loosening the mulch, introduction of crop rotation, removal of crop residues from the field and need deep plowing

Anthracnose infects the leaves, stems, flowers and pods of mung bean. When the spring comes cold, the seeds infected with anthracnose rot or a weaker plant grows. In mung bean, the disease is caused by the fungus Colletotrichum Lindemuthianum. Brown or red spots appear on the seeds. When the air is cool, red bumps appear in the middle of the spot. In the leaves, the veins are damaged, they turn brown, and the tissue adjacent to the leaf veins turns yellow and dries. Small yellowish-red spots appear on the pods, they gradually intensify, sometimes the spots merge with each other, the damaged tissue deepens and becomes like a round wound. When severely damaged, the mycelium of the parasite enters the seed, and on its surface, as in pods, spots are formed.

Anthracnose disease in the seeds occurs in the form of red spots. When the air arrives, red circles appear in the middle of the spot, which are composed of single-celled elongated conidia and conidia stalks. Conidia pass from diseased seeds to ragweed through raindrops, wind, and insects, and germinate from it. As a result, dark brown spots appear on the stem, it rots and the grass dies.

Damaged seeds and plant debris are the first source of disease transmission.

In the fight against this disease, adherence to crop rotation, placement of crops in well-ventilated open areas, folicure 25% em.k.-0.5 l / ha, folicure BT 22.5% em.k.-0.5 l / ha, title 390 KEK-0.3 l / ha, bumper 25% em.k. and duplet TT 22.5% em.k.-0.5 l / ha fungicides should be applied at the specified rates.

Ascochytosis (spotting) is caused by the fungus Ascochyta phasolorum. This disease affects the surface of the plant. On the stems and leaf bands of the plant appear elongated brown, and on the pods appear oily, shiny, light brown spots of oval shape. The pycnospores of the pathogen spread inside the crop by rain, wind, and damage healthy plants. The fungus overwinters in seed and plant debris.

Creation of resistant varieties to prevent mosquito-borne disease, introduction of crop rotation, extraction of seeds from healthy crops, pre-sowing seeds 200 FF, 34% s.s.c.-2.5 l / ha, protection 10% s.-4, 0 l / ha, darmon-4, 25-30% kuk, -3.0 kg / t, baraka 60% p, -0.4 kg / t and raksil 2.5% s.e.s.-0, It should be treated with 7 l / t. When symptoms are observed, the follicle is 25% em.k.-0.5 l / ha, the title is 390 KEK (390 g / ha) -0.3 l / ha, the bumper is 25% em.k. and the duplet TT should be sprayed with one of the fungicides 22.5% em.k.-0.5 l / ha.

Floor-dew disease Erysiphe communis f. phaseoli stimulates the fungus. It infects all the above-ground parts of the plants, and on them develops a layer of white, then gray, resembling flour spray. Flour-dew grows strongly in conditions of air temperature 20-250 and humidity 70-
80%. Late sown crops are usually more severely damaged. Often damaged plants do not die, but as a result of small leaves and pods, decreased photosynthesis and disruption of physiological processes in the plant, the yield is reduced by 15% or more.

Introduction of crop rotation to combat the disease, when the symptoms of the disease are observed follicle 25% em.k.-0.5 l / ha, follicle BT 22.5% em.k.-0.5 l / ha, title 390 KEK -0.3 l / ha, bumper 25% em.k. and duplet TT 22.5% em.k.-0.5 l / ha spraying fungicides, the field should be cleared of plant debris after harvest.

Mung bean mosaic. It is a dangerous viral disease that reduces the yield of mung bean grain by 55-70% and the mass of beets by 30-65%. A dark border appears around the veins of the affected leaves, and the edges of the leaves are bent. Then a distinct mosaic develops on the leaves, which take on a strongly wrinkled shape. Plant height decreases and lags behind in development. The vectors of the disease are seeds, as well as aphids, spiders and other insects.

Mung bean's rust disease - on its leaves, stems appear in the middle of summer in the form of brown pillows. The disease is caused by the fungus Uromyces phaseole Wintur.

The intermediate host of the disease is the milkweed, the uredo and teleytospores grow in the mung bean, and the eczema in the milkweed. While uredospores are formed several times during the summer, teleytspores are formed in plant debris at the end of the growing season. In the following year, basidiospores are formed from teletospores, which damage the milkweed. Etsidospores formed in the dairy plant fall into the mung bean and infect it. The leaves of diseased plants turn yellow, and yields are sharply reduced.

To combat the disease, it is necessary to remove weeds from crop fields, remove plant debris, dig the soil deep and plant resistant varieties.

Bacterial diseases (bacterial spot, bacterial wilt, and bacterial oreal) are caused by the fungus Xanthomonas phaseoli. In this disease the stems are particularly severely damaged, small reddish-dark spots appear on the stem. A red ring appears where the seeds and leaves meet. The stem may break from the injured joint or the plant may wither. Small, light-colored spots, like a drop of water, are the first signs of disease on the leaf, which appear first on the underside of the leaf and then on the top. Later, the spots become clear. At first they turn yellow or light green and then they darken.

Most of the spots on the edges of the leaf are larger. Bacteria enter through the lips or through the injured areas. Small, watery, dark blue spots fall on the pods first, then the spots become much larger, so it is often possible to see that they are surrounded by a lot of watery spots. The stain all dries and turns a brownish-red color, sometimes it forms a yellow crust composed of countless bacteria. Bacteria enter the pod through the fruit band, resulting in a dull red elongated spot along the entire length of the pod. If the seed is damaged early, it will wrinkle immaturely, and when damaged before maturation, shiny yellow spots will appear on the seed coat. Infected seeds and plant larvae are a source of infection. Bacterial spot disease develops very much when the temperature rises and the humidity drops.To prevent bacterial and fungal diseases of mung bean, sow only healthy seeds, select resistant varieties, seeds 200 FF, 34% s.s.k.-2.5 l / ha and protective 10% s.s.-4.0 l / ha. should be treated with.

Mung bean, like other agricultural crops, is infested with pests during the growing season in the field and during grain storage. According to the data collected, about 24 species of mosquitoes were found to be damaging the mosquitoes. Pests such as root nematodes, spiders, aphids, autumn nightshade, caterpillars, acacia lice (sap), pea lice (sap), greenhouse aphids, bean sprouts and pea spores are found in the mung bean growing areas.

In areas planted with mung bean, sometimes green sap appears, which feeds on young shoots and lower parts of the plant. The pest infects the young branches and the back of the leaves of the plant from the time the seedlings sprout until the end of the growing season. When the sap falls too much, the growth of the plant stems stops, the leaves curl, and the plant stem twists, the fruits do not ripen, and the yield decreases.

Autumn nightmare. It is a common pest and worms live up to 5 years. Adult juveniles overwinter at a depth of 5–15 cm in the soil during the larval stage. Butterflies

lay an average of 500-600 eggs. Mainly first-generation worms cause serious damage to sprouted grasses and young seedlings. Cutting the seedlings drastically reduces the number of bushes

Cossack worm. It lays one egg at the point of growth of the plant. The eggs are domed. It lays an average of 800-2000 eggs during its lifetime. The body is light green, ranging from bluish-yellow to dark brown. Gives offspring up to 4–5 times in a lifetime. It infects legumes and grains.

Pea lice (juice). Mosquitoes, mainly mosquitoes from sucking pests, also cause significant damage. Pea juice occupies a special place

among the juices, as it is widely distributed in the mung bean areas and causes great damage. This pest overwinters in the mouth of the bed without mature fertilized eggs.

The development of sap lasts from an average of 10 to 15 days in the early spring to the emergence of a new egg to a mature one. It develops in one season from March to September, giving 19-20 generations. The single-winged female aphids produce an average of 70-80 larvae, while the winged aphids produce up to 15-20 larvae. In May, alfalfa saplings appear among the wingless saplings and continue to grow, flying to other crop fields.

In late May and early June, the winged saplings multiply en masse and move to the mung bean fields, damaging the young seedlings and developing until the mung bean is harvested. In the autumn after mowing, the winged saplings re-emerge into the alfalfa fields and develop until they overwinter.

Juices mostly asked for plant leaf juice. As a result, the leaves can change shape and dry out due to a decrease in the amount of reserve carbohydrates in the stem and root. Strong contamination of the mung bean plant with sap leads to a decrease in the amount of hay, legumes and grain weight.

Acacia lice (juice). It is a common pest in Central Asia, infecting mosquitoes by sucking its leaves and flowers in May-June. As a result, the leaves do not curl and lose their natural state. Long damaged leaves turn yellow and fall off. The seeds of a damaged caterpillar also become useless and unfit for consumption and planting. Acacia lice hibernate in the egg phase on the acacia tree, some of which can also overwinter as adults and larvae. Reproduced live by parthenogenesis. Gives up to 17-20 generations. Delays plant development by 5-10 days and leads to a 10-15% reduction in yield.

Spider mite – (Tetranuchus urticae Koch) is a deadly pest of mung bean, it lives and feeds on the back of its leaves from the time the plant produces 4-5 petals, where it forms a felt-like thin spider's nest. The leaves of the affected plant gradually discolor, wither and fall off. The plant does not develop normally, resulting in the grains in the first bush becoming useless without ripening. This pest infects mosquitoes by 40-50%. According to the data, in Uzbekistan, a spider lays 160-600 eggs and lays 18-20 offspring. However, the reproduction of spiders is directly related to their nutrient environment. Especially when their females are fed with protein-rich plants, they are prolific and the time required for the development of one offspring is also reduced.

Greenhouse whitewash. The body is 1.3-1.8 mm long, yellowish, has two pairs of white-unshundring quality wings. The larvae are flat, oval-shaped. Harms many plants. The larvae are damaged by sucking the leaf sap. It multiplies rapidly, giving a new generation every 25–40 days.

Another mosquito pest is the ***woodpecker bruxus beetle***. graineater bruxus beetles belong to the family graineater of the family of hard-winged insects of the insect class and cause great damage in all legume crops, especially mung bean, beans, peas. Currently, 12 species of donkey bruxus are known in the insect fauna. In our conditions, there are three types of bruxus. These are the pea grain (Bruchus pisarum Z), the bean grain (Acanthoselides abtectus Say) and the four-spotted grain (Callosobruchus maculatus Z).

Graineater bruxus beetles live in the fields during the harvest, in the threshing floor and in large quantities in the grain stored in warehouses, and in the field conditions in the surface layer of the soil at a depth of 8-10 sm without beetles. Graineaters begin to emerge from the winter in the first ten days of May in areas planted with mung bean. The beetles that emerge from the winter feed on the flowers of alfalfa and wild plants around the field until the legume crops enter the flower.

One of the special biological features of graineater is that in order for their reproductive cells to mature, the grain grower must, of course, be fed the flowers of this legume. The Graineater place the eggs one on top of the fully cooked blue beans and seal them firmly with a special self-extracting liquid.

Graineater are very fertile, with one female laying an average of 110-130 eggs and a total of 220-230 eggs. The development of eggs lasts for 5-6 days, depending on weather conditions, the larvae that hatch from the eggs begin to damage the grain by gnawing on the surface of the blue pods. A single grain develops in a single grain. Larval development averages 30-35; the development of the fungus is 19-20 days, and it takes at least 45-50 days for the full development of the fungus. The emergence of a new generation of fungi from the fungus occurs in mid-July, and the emergence of large numbers occurs in early

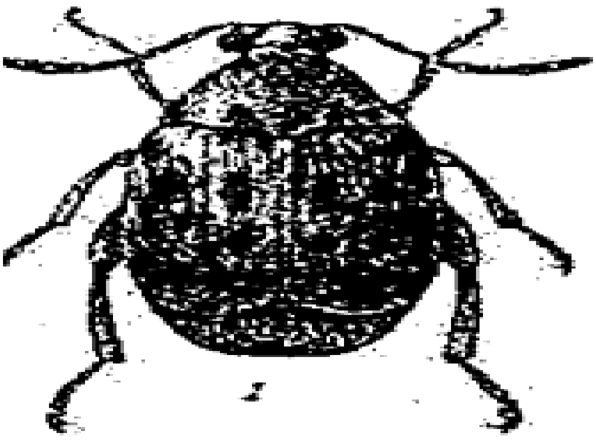
September. Thus, in the field, the grain grower produces one, and in the barn up to 3-4 generations. Grains damaged by grain growers become absolutely unfit for consumption (tahir), germination is reduced by 50-75%.

Grains sown in the spring are less damaged than grains sown in the summer. the reason why mung bean grains sown in summer are so infested with grain is that the mung bean blooms en masse, the grain is fed to mung bean flowers that appear in the fields of mung bean.

Pea graineater. It is the worms that gnaw and damage the grain, thereby reducing the market value and seed quality of the grain and rendering it unusable.

The pea-grower, like other grain-growers, overwinters in the field and in the grain stored in the barn.

Bean graineater – mainly domestic quarantine insects. Its larvae and



beetles pierce the mung bean beetle, gnawing at the grain and rendering it unusable. Grain damaged by the grain completely loses its state of consumption and planting properties.

The bean grain grower, like other grain growers, overwinters in the field and in the grain stored in the barn without any maturity (beetle).

Four-spotted graineater mung bean causes great damage in field conditions, as well as during the storage of grain in the warehouse. As a result of its damage, the grains become completely unfit for planting and consumption. This graineater is the most common cosmopolitan pest in the Republic. This pest is widespread in Greece, Italy, Belgium, England, Yugoslavia, Bulgaria, Africa, North and South America, Australia and Uzbekistan.

Pest control measures: In the summer, tarpaulins and the like are written on the higher plain at the edge of the building, pool and trees, and the grains to be decontaminated are thinly rolled up and heated in the sun for 3-4 days. It is rolled 2-3 times a day with a wooden shovel. In the evening, the grains are collected and covered with a tarpaulin. It is then cleaned of pests. Storage of grain (not sown) stored in the warehouse at a temperature of 600C for 2-3 hours has a devastating effect on the pest. If the temperature in the warehouse is kept below 00C degrees, the beetle beetles will stop developing. 3-5 months before sowing of mung bean seeds against diseases is treated by soaking Vitavaks 200 ff with 34% aqueous suspension concentrate at a rate of 5.0 kg / t or Fundazol 50% moistening powder - 2.0 kg / t.

-Application against root-eating weevils, aphids, thrips and weevils at a rate of 4 l / t at least 20 days before sowing of leguminous seeds, ie Avalanche 5 kg / ha, Cruiser or Cruiser extra preparations at a rate of 4 l / t;

-B-58 40% em.k. for legumes 30 days before harvest against grain bruxus. 0.5-1.0 l / ha, Karache 10% em.k. 0.1-0.2 l / ha, Atilla 5% em.k. Application of chemicals in the amount of 0.2-0.3 l / ha;

- BI-58 new 40% emulsion concentrate (em.k.) 1.5-2.0 l / ha, Karate 5% em.k.- 0.5-1.2 l / for chemical control of pests in the field? or Fufanon 57% em.k. drugs to canals, syrups, thrips, aphids, moths, fruit; Omayt 57%, em.k. the drug to spiders; Superkil 25% em.k. use of the drug against moths and rodents;

-Nissoran 5% em.k. in the protection of legumes, especially mosquitoes from spiders. 0.1-0.2 l / ha, Ximgold 72% em.k. 0.3 l / ha, Vertimek 1.8% em.k. 0.2 l / ha, Gold 1.8% em.k. 0.3 l / ha, Uzmayt 57% em.k. It is recommended to use at a rate of 1.2 l / ha.

Sulfur preparations during the growing season: application of lime sulfur decoction (ISO) at a concentration of 0.5-10C or spraying sulfur talc at a rate of 20-30 kg / ha prevents the development of powdery mildew and spider mites.

In the biological control of mosquito pests entomophagous are used goldfish, trichogramma, bracon, khanqizi, enkarsia and others. Entomophagous are used in the morning and evening cool.

In some cases, in addition to the use of modern pesticides, it is possible to use a tincture or decoction of some plant species in water against insects, as well as dried and ground powder.

For example, when using a decoction of sarzan plant, it lost 82-86% of its juice. Anti-glare tobacco, tomato and hot pepper decoctions and kakra juice can also be used. Mustard powder can lose 80% of its juice. When the juice of the leaves and flowers of the coral tree was added to the water and sprayed, it was up to 94% effective.

From agro-technical measures, especially the selection of resistant varieties, removal of plant debris, plowing the soil with a two-tiered plow and alternating planting prevent pest damage. Mung bean fields planted in early spring should be placed as far away from old alfalfa fields as possible.

Timely and thorough tillage is one of the most important conditions for growing a healthy and hardy plant. Soil washing,

leveling the fields, autumn plowing, row spacing play an important role in plant protection. When jacob water is applied in the autumn and winter to wash away the soil salinity, the soil salinity disappears, a lot of moisture accumulates, and healthy seedlings resistant to pests and diseases sprout evenly. In addition, most of the insects and weeds in the soil are killed. As a result of leveling the fields, there will be no places where pests and diseases accumulate. Plowing and weed seeds at a depth of 30 cm in a furrow or double-tiered plow at ground-based periods is a powerful remedy for pests and weed seeds, pathogens.

The norm and scheme of planting legumes, which provide row spacing, seedling thickness and their illumination by sunlight, play a special role in the formation of pest fauna in this biocenosis, while they are one of the main factors in the formation of complex harmful entomofauna in this agrobiocenosis.

Fertilization also plays two different roles in protecting plants. Fertilizer (especially nitrogen) in the early stages of plant development

The application of phosphorus and potassium fertilizers to legumes leads to an increase in their generative organs, a strong root system, quality and high yield. Timely application of mineral fertilizers leads to disruption of the developmental phases between the plant and the pest.

It is also important to control mosquito pests and diseases by deep plowing the land in autumn, planting crops in the right order, burning the remains of dung, sowing seeds prepared from healthy plant tubers, weeding and timely irrigation, harvesting, drying and there are also general measures such as cleaning, removing residual stems and leaves, and storing seeds in dry ventilated buildings.

CHAPTER III. RESEARCH AND RESULTS ON MUNG BEAN CULTIVATION

3.1. Soil-climatic conditions of the experimental site

Soil condition. Field experiments were conducted on the farm named after Abdirasul Bobomurodov in Shahrisabz district of Kashkadarya region, located on the north-eastern side of the Gissar mountain range.

Agriculture in Kashkadarya region is mainly divided into three groups. The first group includes Kitab, Shakhrisabz, Yakkabag, Chirakchi and Kamashi beani districts. In these areas it is not necessary to give reserve water to the soil before planting. This is because the moisture reserve in the soil is sufficient for the germination of spring crops. The second agricultural group includes the desert part of Chirakchi and Kamashi beani districts and Guzar district, the third group includes Karshi, Kasan, Nishan, Kasbi, Mubarek and Mirishkor districts, and the seeds do not germinate if the soil is not watered before planting due to the light granulometric composition of the soil. The experimental site is an area that does not require reserve water, and the moisture in the soil is sufficient for the germination of spring crops [71].

Due to the strong influence of weather and soil conditions on the cultivation of agricultural crops in the region requires a separate analysis of precipitation, temperature and soil properties.

Soil and climatic conditions of Kashkadarya region change in proportion to the characteristics of the soil. This is because soil types also change over the years through natural factors [18; 102].

The soil of the experiments was typical gray soil, and the level of civilization increased as a result of irrigated agriculture for many years [19; 94].

B.V Gorbunov et al. [25; 26; 27] in their work studied the gray soils for irrigated agriculture in detail, developed appropriate conclusions and recommendations for their effective use.

Typical gray soils make up 40% of the total irrigated arable land in Kashkadarya region, most of which is located near the Gissar mountain range and the Zarafshan plateau. Such soils are composed of lyoss and lyossimon medium and light sands, in some cases small stones, and proluvial deposits. By their nature, typical gray soils are close to dark gray soils. However, in typical gray soils there is less humus and more gypsum. Typical gray soils are less likely to be eroded by precipitation due to their relatively flat location and are common in the lower regions of the mountains. These soils are found at an altitude of 350-800 meters above sea level [51].

In addition, these types of soils are also common in areas adjacent to light gray soils, where the climate is mild and comfortable, and is characterized by high rainfall. In such lands, the average annual rainfall is around 500 mm.

The typical gray soil region is characterized by sernam, despite the hot summers, no severe cold of the winter months and precipitation mainly in autumn, winter and spring, the genetic horizon is up to 60 sm, in this layer humus is widespread. Carbonate salts are common in layers of 70 sm and below. After a depth of one meter in these soil zones, lyoss and lyossimon parent rocks begin. The granulometric composition is sandy and coarsely dusty. The density of the soil is up to 1.22 g / cm3 and the porosity is up to 55%. As a result of irrigated agriculture, the soil layers have been stratified and the amount of humus has decreased. As a result of irrigation, humus and carbonate salts are also distributed in the lower layers of the soil [94].

The experimental area is typical of gray soils, which have long been irrigated and cultivated. If an accelerated crop rotation system is widely introduced on such lands, there is a strong tendency for these lands to increase productivity and efficiency.

The average amount of humus in the tillage layer of these soils does not exceed 1.2-1.5%. Nitrogen content is 0.10-0.11%, phosphorus is 0.15-0.25%, potassium is 2.1-3.0%, and the absorption capacity of the soil is 10-12 mg / eq. Calcium absorbed in the soil is up to 90%, magnesium up to 15%, and sodium content 1-2%. This type of soil is the main agricultural region of Kashkadarya region and does not require additional agrochemical measures. For this reason, special coefficients are not applied in the use of fertilizers in the process of cultivation in typical gray soils.

Climate conditions. The place of the experiments belongs to the typical gray soil zone of the region, and we will focus in detail on the climatic conditions of this region.

The typical gray soil zone of the region includes the foothills of Kitab, Shakhrisabz, Yakkabag, Kamashi beani and Guzar districts from 300-400 m to 600-1000 m above sea level. Precipitation in this region is higher than in the desert regions [24].

Kashkadarya region is located in the south-western part of the country, where cold air from the north in winter and warm air from the Karakum desert in the west in summer form a sharply changing weather. Due to the fact that the hot and cold air coming from the south-west does not reach Shakhrisabz completely, the weather in this region is mild and the relative humidity is high.

The effective temperature sum in Shahrisabz averages 2519°S. The average annual air temperature in the region is 14.9°S, the relative humidity in April-October is 49%, the amount of precipitation is 140 mm. Moisture evaporation is 1110 mm, lack of moisture is 970 mm, precipitation in October-March is 394 mm, evaporation is 294 mm and the duration of the growing season is 219 days, the sum of temperatures above + 10°C is 2519°C.

The duration of frost-free days is 213-233 days, and the first autumn cold days are from October 14 to November 2. The last spring cold is March 16-25, with variable air temperatures above + 10°C starting March 21st.

The average perennial temperature during the growing season (April-September) of crops is 22.9-24.5°C. The maximum air temperature rises to 45-47°C in July. The relative humidity during the growing season is 33-49%. In July-August, the relative humidity decreased to 22%. The result is a lack of moisture.

Data on the average daily air temperature in the years of the experiments are given in Table 3.1.1, and the amount of monthly and annual precipitation in Table 3.1.2.

In the years of the experiment, the air temperature in July during the mung bean cultivation in the fall wheat field ranged from 28.5°C to 34.6°C; in August it was observed to vary from 25.0°C to 31.3°C. In September and October, the air temperature decreased slightly, from 27.1°C to 19.6°C in September, and from 24.0°C to 15.1°C in October.

Also, during the growing season of the mung bean, no precipitation was observed in July, August and September, only 23 mm in October 2001. For this reason, mung bean grown in the fall wheat field makes efficient use of reserve water and moisture rising to the tillage layer of the soil through the roots of the wheat, which is sufficient for its growth by the end of the mung bean period.

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The main part of precipitation in Shahrisabz was observed in November, December, January, February, March, April and May. Since there is almost no precipitation in June, July, August, September, artificial irrigation of crops grown during this period is required.

Table 3.1.1

In the experimental years, the average daily air temperature, C°

Years	January	February	March	April	May	June	July	August	September	October	November	December	Average
2001	1,2	6,2	12,0	18,7	25,6	29,3	28,5	26,4	20,8	15,1	11,3	7,8	16,9
2002	4,7	17,6	18,1	19,0	14,7	34,0	34,6	27,0	22,1	17,0	1,6	9,0	19,9
2003	11,0	16,1	14,5	20,0	30,0	38,0	34,0	30,0	24,8	24,0	11,0	12,6	21,8
2004	3,0	7,0	18,4	21,0	18,6	30,0	34,0	25,0	27,1	17,4	17,0	6,7	18,8
2005	7,6	9,7	11,3	21,0	22,0	34,0	34,0	31,3	19,6	21,2	14,3	13,0	20,8
perennial	8,8	13,4	15,0	19,5	23,4	27,6	32,5	27,5	18,5	15,3	8,3	7,9	18,1

Table 3.1.2

Amount of precipitation in experimental years, mm

Years	January	February	March	April	May	June	July	August	September	October	November	December	Average
2001	53,0	76,0	52,0	6,0	0,0	0,0	0,0	0,0	0,0	23,0	45,0	80,0	335,0
2002	16,0	11,0	39,3	51,0	7,0	0,0	0,0	0,0	0,0	1,7	30,3	23,0	179,3
2003	20,3	12,0	61,3	41,6	7,6	0,0	0,0	0,0	2,0	3,8	10,0	81,0	297,6
2004	44,1	30,4	47,0	31,0	0,9	0,0	0,0	0,0	3,0	0	29,4	51,7	234,5
2005	18,3	12,1	31,0	17,0	18,3	1,0	0,0	0,0	0,0	7,9	30,3	47,0	183,7
perennial	41,8	37,9	43,7	42,1	12,3	0,0	0,0	0,0	0,0	14,7	42,9	54,7	290,1

The low rainfall during the growing season of crops in the experimental region requires artificial irrigation, which requires the development of technology for the economical and efficient use of soil moisture for each region due to limited water resources for irrigation. The duration of the growing season, which consists of cold days with sufficient air temperature, allows the land to be used continuously throughout the year, creating opportunities for several crops per year.

3.2. Research methodology and maintenance activities in the experimental field

Field experiments and production tests were carried out according to the methods of "Methodology of state sortoispytaniya selskokhozyaystvennykh kultur" [61] and B.A. Dospekhov's "Methodology of field opyta" [31].

In conducting experiments, the manual "Methods of agrophysical research" [62] [1973, 4th edition, SoyuzNIXI] was used in conducting agrophysical analysis of soil.

In order to determine the volumetric mass of the soil, soil samples were taken from each variant of the experiment before planting and at the end of the application period from 0-30 and 30-50 cm layers of soil using a cylinder and weighed by N.A. Kachinsky method.

The manual "Methods of agrochemical analysis of soil and plants" [63] [1977 5th edition, Tashkent, SoyuzNIXI] was used in agrochemical analysis of soil.

Experimental field soil samples were taken from 0-30 and 30-50 sm layers of soil at the beginning and end of the application period, the humus content was determined by the method of I.V. nitrogen content was determined by calorimeter method, mobile phosphorus by B.P.Machigin, exchangeable potassium by flame photometer by P.V.Protasov methods.

The cost-effectiveness of the average market price of mung bean grain and the cost-effectiveness of the net profit were calculated according to the method “Basic rules for determining the economic efficiency of scientific research” (Moscow, 1937).

Phenological observations and calculations in plants

Based on the goals and objectives of the experiments, phenological observations and calculations were performed on plants in the following order.

In Mung bean, phenological observations were made on 50 specially labeled plants in I and III repetitions of each variant of the experiment.

- Seed germination rate,%;
- seedling thickness, thousand / pieces (at the beginning and end of the application period);
-number of leaves, pieces;
- plant height, cm;
-number of harvest branches, pieces;
-number of beans, pieces;
-number of tubers, pieces;
-1000 grain mass, g (at the end of the validity period);

The grain yield of crops was determined.

The field experiment was conducted in one tier, four rounds, the field length was 50 meters, each option was 8 rows, the row spacing was 60 sm, the width was 4.8 m, the area was 240 m2, the calculation area was 120 m2, the total area of the experiment was 1.44 e. The experiment was conducted on the basis of the following experimental system (Table 3.2.1).

In determining the sowing rate of Mung bean 's “Radost” sort, the seeds were first sieved to ensure the size, weight and uniformity of the seeds. The weight of 1000 pieces of mung bean seed was then determined in 5 samples and the average weight of the seed grain, i.e. the weight of 1000 pieces, was found to be 40 grams on average. According to these indicators, the cost per hectare of mung bean seeds was calculated in kilograms.

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Table 3.2.1 Experimental system

Experiment options	Sowing dates	Planting norms, thousand pieces / ha	Planting norms, kg / ha
1 (control)	1.07	260	10,4
2		330	13,2
3		400	16,0
4		470	18,8
5		540	21,6
6 (control)	15.07	260	10,4
7		330	13,2
8		400	16,0
9		470	18,8
10		540	21,6
11 (control)	1.08	260	10,4
12		330	13,2
13		400	16,0
14		470	18,8
15		540	21,6

The field germination rate of mung bean seeds sown in the furrow at different times and norms was determined every 3 days after full germination of seedlings after the start of germination in 5 plots of 16.6 p / m each. The level of preservation of seedlings was calculated on the eve of the harvest of mung bean in the same designated areas.

To determine mung bean flowering and number of pods, 100 plants were identified in all variants of each variant of the experiment, and the average number of flowers and pods formed per bush was determined at 10-12 days after flowering, 10 days after flowering and pollination. and the percentage of pods per flower per plant was also determined.

The height of the mung bean and the height of the lower pods relative to the ground were determined in all returns of the experimental options after the complete formation of pods in 5 out of 100 plants, the average height of one plant and the height of pods from the ground.

In studying the duration of the vegetation period of Mung bean, from its germination - produced 6 leaves; From the release of 6 leaves - the formation of buds; from bud formation to flowering; from flowering to fruiting; periods from fruit formation - to medium ripening and from medium ripening - to full ripening. Phenological observations were made during this period on the designated sites of all variants of the experiment.

The total number of mung bean pods in all variants of the experiment was determined at 5 locations, each consisting of 100 plants, and the average per plant was determined. The ones that were full of whole grains were the pods, and the total amount of all the pods formed in a single plant was calculated.

The number of grains in the pods was determined as follows. The total number of grains formed in one plant was found by dividing the total number of grains per 100 plants by 100, when the 5 pieces identified in all returns of the experimental options were taken from each of the 100 plants at 70% ripening.

After determining the grain yield at each of the 1000 experimental plots, 5 samples were taken from each of the experiment variants, and 1000 grains were weighed and the average weight was determined.

The average amount of organic matter accumulated in the surface of the mung bean per plant was determined when the mung bean was fully ripe due to the dry matter. To do this, in all returns of the experimental options, the topsoil was removed and dried from each of the 5 designated plots when 100 plants were fully ripe, the weight was weighed, and the average amount of organic matter per plant was determined at 100.

In all plots of the experimental variants, a soil zone with roots in a 50 cm layer of soil was excavated during the budding phase of the mung bean and 50 pieces of plant roots were washed in running water. The number of tufts in 50 plants was then determined, divided by 50, and the average number of tufts formed in 1 plant was determined. The tubers in 50 plants were separated and dried in a thermostat, the weight was determined on the scales, and the average weight of the tubers in one plant was determined by dividing by 50.

The grain yield of mung bean was determined by weighing all the plants in the calculation area (120 m^2) separately, dried and weighed on all variants and returns of the experiment.

The grain obtained from the experimental options and returns was mathematically analyzed by B.A Dospekhov's analysis method.

Options that gave good results in field experiments were tested experimentally in production.

In the experiment, the Radost variety was planted and cultivated. Radosh variety of mung bean was created at the Uzbek Rice Research Institute, included in the State Register in 2001 and regionalized in Kashkadarya region for spring and summer cultivation.

Radost is 60-70 sm tall, the first pods appear 15-17 sm above the ground. It is convenient to harvest this variety with the help of combines. The buds have 6-8 flowers and the pods have 10-14 seeds. Radost differs significantly from Pobeda-104 in that it weighs 1,000 grams, weighs an average of 30-49 grams, and has a protein content of 24.2% to 27.3%. The average yield is 1.72 t / ha. The average growing season for Mung bean Radost is 101 days in spring and 80-85 days in spring. If planted late in the summer, the growth period will be shortened. Mung bean Radost is more resistant to diseases, adverse conditions, especially high temperatures and lack of moisture than Pobeda-104.

Agrotechnical measures used in the experimental field. After harvesting the Kupava variety of winter wheat with a combine, the field straw was harvested, 900-1000 m^3 of reserve water was given per hectare, and after plowing, the furrow was plowed with a two-tiered plow (PYa-3-35) to a depth of 28-30 sm.

As the soil matured, it was treated longitudinally and transversely with a harrow attached to the mulch and mulch, and harrowing was carried out to prevent evaporation of moisture from the lower layers of the soil. Using the KRX-4 cultivator fertilizer, the seeds of Radost variety were sown using a cultivator mixed with 50 kg of ammophos fertilizer (physically) per hectare at the time and in accordance with the experimental system. To ensure that the specified amount of mixture was on the experimental system, it was determined by using a tractor in the open, collecting the falling seed and fertilizer mixture in bags, and weighing it on a scale. Depth of sowing was 4–5 sm. Once the weeds in the mung bean field were fully germinated, they were removed once by hand.

Mung bean was not irrigated during the growing season. Because the groundwater level in the experimental field was 1-1.5 m, the soil moisture at the time of planting was an average of 20.2% in the driving layer of 0-30 cm. This moisture was considered optimal for seed germination and a flat germination. As a result of the efficient use of natural moisture in the soil during the growing season, the seeds did not need additional irrigation for seed germination and plant growth and development. If the mung bean is irrigated during the growing season under such conditions, the mung bean grain will harden and become unfit for consumption.

The ripe mung bean was harvested in late September between the first ten days of October.

3.3. Agrophysical properties of soil

The volumetric mass and porosity of the soil determine its hydrothermal, air, microbiological properties. Since its volumetric mass and porosity are directly related to the growth, development and activity of the plant root, these studies have paid special attention to these indicators.

Soil volume mass is highly variable and depends mainly on the degree of compaction of the aggregates. The drive layer usually has a small bulk mass (1.1–1.3 g / cm^3) because in this layer the aggregates are porous. Due to the decrease in the amount of aggregates in the underlying layer and the density of aggregates and particles, the amount of voids decreases, resulting in an increase in volume mass (1.5-1.7 g / cm^3).

According to the literature, plant growth and development is good when the soil volume mass is 1.1-1.3 g / cm^3. In this case, the root system of the plant develops optimally, the air exchange in the soil is moderate, the evaporation of moisture is less. The denser the soil, the greater the lack of moisture for the plant.

The plant grows well in an optimal volume of soil, creating a favorable environment for high yields. This is because the change in volume mass alters the hydrothermal, aeration, microbiological, and finally nutrient regimes. Too high a soil volume mass adversely affects the aeration process in the soil, resulting in the plant root not being able to grow freely and deliver nutrients.

For the normal growth and development of agricultural crops, the presence of physical regime conditions in the root soil layers is required. Soil volume mass is considered to be the most important indicator of physical performance. With the change in soil volume mass, all the physical parameters of the soil change, including physico-mechanical, water-air, thermal properties, biological activity, and nutrient regime.

In maintaining and increasing soil fertility, the rapid passage of microbiological processes in the soil, the formation of humus in the soil, the intensity of the formation process, the amount of humus depends on the number of beneficial microorganisms in the soil. The number of beneficial microorganisms in the soil depends on the type of soil and its agrophysical properties. One of such agrophysical properties of soil is its bulk density.

A number of scientific studies have been conducted to increase the volume mass of the soil, and solid data have been obtained.

D.N Pryanishnikov [83] studied the positive effect of organic residues of all types of plants on the volume mass of the soil.

According to MA Belousov and F.I Ismailov [12], the volume mass of the soil decreased from 1.43 g / cm^3 to 1.31 g / cm^3 after the forage crops were driven into the soil.

All types of crops increase the volume of the soil during the period of application. Once they are driven into the soil, the soil volume mass decreases. During the period of application of alfalfa, the volume mass of the soil was 1.38 g / cm^3, after plowing it was 1.27 g / cm^3, and when alfalfa was planted with water, it increased from 1.37 g / cm^3 to 1.24 g / cm^3, respectively. , when sown with oats and then oats, it decreased from 1.27 g / cm^3 to 1.21 g / cm^3 [87].

According to Hussain S.K., Michlken W [141], the UK pays great attention to planting crops that leave as much organic residue in the soil as possible, improving soil agrophysics.

According to L.A Spijevskaya and M. Tojiev [93], legumes compact the soil to a lesser extent than alfalfa. Their small root systems improve the water-physical condition of the soil by increasing the amount of humus and organic matter in the plant during the growing season.

Experiments have shown that mung bean is a crop after shade as a crop that has a positive effect on soil volume mass. In the conditions of irrigated light gray soils of Kashkadarya region, repeated sowing of winter wheat in the furrows at different seedling thicknesses had a different effect on the soil mass. If the volume mass of soil in the area planted with mung bean was 1.138 g / cm^3 in the driving layer (0-30 cm) at the beginning of the application period, this figure was 7024 seedlings per hectare at the end of the application period - 1.243 g / cm^3, 90 thousand seedlings per hectare. 1,241 g / cm^3, in the variants of 110-130 thousand seedlings - 1,238 g / cm^3. That is, an increase in planting norms led to a positive change in soil volume mass [113].

The denser the soil, the greater the lack of moisture for the plant.

The root of each crop requires its own optimal soil compaction. If the density exceeds this norm, it will adversely affect the plant and the yield will decrease. Therefore, it is important to create and maintain an optimal density in the layer where the main root of the crop is spread.

In the experiments carried out in the conditions of typical gray soils of Tashkent region [115], positive changes in soil volume were observed in the intercropping of cotton, winter wheat and secondary crops.

Cotton of the 1: 1 rotation system: winter wheat + repeat crop (mung bean): cotton and cotton: winter wheat + repeated crop + intermediate crop: if the soil mass in the cotton link is close to the initial values under the influence of repeated and intermediate crops, crop rotation 2: Autumn wheat

+ repeat crop (mung bean) in system 1: winter wheat + repeated crop (mung bean): cotton and winter wheat + repeated crop (mung bean): autumn wheat + repeated crop (mung bean) + intermediate crop: in the cotton links, these figures are higher than before Decreased to 0.01–0.02 g / sm^3. It can be seen that the sowing of winter wheat and then secondary crops and intermediate crops in crop rotation systems 1: 1, 2: 1 alternated the soil mass slightly, and in most cases it was reduced.

Another important physical property of soil is its porosity. When the level of porosity of the soil is high, air exchange improves, the passage of microbiological processes accelerates, thermal regimes change in a positive direction, resulting in certain conditions for soil fertility. Porosity depends mainly on the mechanical composition, structure of the soil, the activity of microorganisms in the soil and the degree of supply of organic matter. The presence of porosity has a positive effect on aeration and water movement.

According to the data from the study of typical gray soil conditions, crop rotation is 1: 1: 1, winter wheat + repeat crop (mung bean) + intermediate crop (triticale): cotton + intermediate crop: soy, 1: 1: 1, winter wheat + repeated crop (mung bean)) + intermediate crop (triticale): soybean: cotton and 1: 1: 1, winter wheat + secondary crop (Mung bean: cotton + intermediate crop (triticale): in systems such as soybean, repeated cereals (mung bean), intermediate crops (triticale) and the planting of soybeans, mainly as a legume crop, ensured that the soil porosity level was 49.6-49.6-48.9%, respectively. This indicates that the porosity level of this soil has improved by 0.7% compared to the initial values.

Another agrophysical property of soil is its water permeability. According to the results of the study, it was observed that the water permeability of the soil also depends on its bulk mass. In the first year of the study, the water permeability was 533 m3 / ha in 3 hours, while in the last year of the study, this figure was 285-314 m3 / ha according to the options. This means that the water permeability of the soil decreased by 40-45% compared to the initial figure, i.e. the experiment was 1: 1: 1 (4,5,6-var) winter wheat + repeat crop (mung bean) + intermediate crop (triticale): cotton + intermediate crop (triticale): soybean, winter wheat + replanting (mung bean) + intermediate crop (triticale): soybean, autumn wheat + replanting (mung bean): cotton + intermediate crop (triticale): soybean replanting in legumes we can observe that it has a positive effect on water permeability. Although re-sowing control after fall wheat option 2 and 1: 1, winter wheat: cotton: winter wheat-grown option 3 has slightly higher water permeability, however, in repeat-crop options, this figure is 40-45 compared to cotton-planted control option m^3 /

ha. In the non-replanted variant, the water permeability of the soil was reduced by 51-53%, in the 6th variant by 40%, and in the 4th and 5th variants with intermediate crops by 11-12%. The recent impact of soybean cultivation on secondary and intermediate crops, as well as the main cereal crop, was evident at the end of the application period in the last year of the study. According to the data, in options 4, 5 and 6 of the experiment, the water permeability of the soil was 509-480-466 m^3 / ha, respectively.

It was observed that even in the conditions of typical irrigated gray soils of Kashkadarya region, substances that are difficult to assimilate by crops are converted into easily digestible mobile form, as well as have a positive effect on agrophysical properties of soil.

According to the data obtained in the first year of the experiment, a decrease in soil volume mass was observed in the topsoil and subsoil layers of the soil when mung bean was grown in the fall wheat field. At the beginning of the application period, the volume volume of the soil in the tillage layer (0-30 cm) before planting is 1.28 g / sm^3, while at the end of the application period, ie after the ripening of the mung bean, the volume volume of the soil decreases by 0.03 g / cm^3. observed. Even in the subsurface layer of the soil (30–50 sm), it was found that the volumetric mass of the soil decreased by 0.02 g / sm^3 (Table 3.3.1).

Table 3.3.1
Agrophysical properties of the experimental field (Kashkadarya region, typical gray soils)

№	Indicators	Soil layers, sm			
		0-30	30-50	0-30	30-50
		before planting		At the end of the validity period	
2001 year					
1	Specific mass, g / sm^3	2,64	2,65	2,64	2,65
2	Volume mass, g / sm^3	1,28	1,32	1,25	1,30
3	Porosity, %	51,6	50,2	52,7	51,0
2002 year					
1	Specific mass, g / sm^3	2,64	2,65	2,64	2,65
2	Volume mass, g / sm^3	1,27	1,30	1,24	1,27
3	Porosity,%	51,9	51,0	53,1	51,9
2003 year					
1	Specific mass, g / sm^3	2,64	2,65	2,64	2,65
2	Volume mass, g / cm3	1,26	1,31	1,24	1,30
3	Porosity,%	52,3	50,6	53,1	51,0

As the bulk density of the soil improves, the porosity of the soil also increases in proportion to it. In porous soils, well-supplied with water, air, nutrients, the development of crops changes for the better due to the increased activity of microorganisms. When the soil is compacted, the porosity decreases, resulting in impaired air aeration, the roots of the crop do not make good use of moisture, and the hardness of the soil prevents deeper penetration of the roots.

In accordance with the mass volume of the soil, the porosity of the soil also improved, corresponding to 51.6% at the beginning of the application period, and by the end of the application period, this figure was 52.7%. These patterns were also observed in the second and third years of the experiment.

It can be seen that as a result of the activity of microorganisms in the soil at high temperatures and under appropriate conditions, the decomposition of root and root residues left in the soil by repeated crops, i.e. the presence of organic compounds had a positive effect on soil agrophysical properties.

Soil moisture. Soil moisture is a key indicator of good plant growth. Proper regulation of soil moisture has a positive effect on plant development and yield. Soil moisture must also be sufficient for good growth of microorganisms in the soil. When the soil moisture is sufficient, different groups of soil bacteria develop vigorously, transitioning from a dormant state to an active state. Since the processes of conversion of organic matter into minerals take place under aerobic conditions, the lack or excess of moisture in the soil creates unfavorable conditions for these processes.

The level of soil moisture is important in the cultivation of a rich harvest. When the moisture in the soil where the plant roots are spread decreases, the plant becomes dehydrated, resulting in a slowdown of physiological processes. For example, when there is a lack of water, photosynthesis and transpiration in the plant slow down and respiration increases. When the soil moisture is very low, the amount of organic matter used for respiration increases. When there is a lack of water during the hot days, ie when the relative humidity in the air decreases, the physiological processes of the plant are disrupted.

Professor N.A. Maksimov described the slowdown in the growth process as a sign that the plant is dehydrated. Depending on the growth of the main stem in the plant and the increase in its total mass, it is possible to know the lack of moisture in the soil and determine the need for watering it.

In irrigated agriculture, any amount of soil moisture can be retained. The upper limit of soil moisture is the field moisture capacity; it is not good to moisten a certain soil layer more or less than this soil layer, as more or less water will increase or decrease the depth of soil moisture.

After the winter wheat harvest, the roots remain in the 1.5-2.0 m layers of soil along with the remnants of its furrows, acting as capillary tubes during the second half of the summer. provides water and nutrients to crops grown as a secondary crop.

As mentioned above, when the autumn wheat is irrigated and plowed with a two-tiered plow, and when the soil is ripe, a heavy mulch and a hurricane presses on the longitudinal and transverse field, while a heavy mulch compacts the soil layer to 8-10 cm. forms a fine soil layer. The compacted layer of soil prevents wasted evaporation by passing moisture through the compacted layer, which rises to the driving layer of the soil through capillary tubes formed by the root residues of winter wheat. A 4-5 sm soft layer of soil formed by storms on the soil surface acts as a barrier to high temperatures and helps maintain soil moisture. This measure will help improve the water supply to repeat crops during the second half of the summer.

Because the experimental area is located in the lower plain part of the Hisorak Reservoir, the groundwater level will never fall below 1.5-2.0 m due to the top-down flow of groundwater.

After plowing with a two-tiered plow, a “gap” appears between the 0-30 cm layer and the bottom layer. Such a "gap", that is, the ruptured state of the capillaries, prevents the moisture in the lower layers from evaporating physically.

In order to scientifically substantiate this, in order to determine the moisture content of the soil during the growing season, the dynamics of soil moisture was studied by planting mung bean in the fall wheat field. Soil moisture was determined by thermostat-scale method from two points to 150 sm layer of soil every 15 days from the date of sowing of mung bean seeds until the crop is fully ripe. The results from the observations are presented in Table 3.3.2.

According to the data obtained, in the first days (1.07) the soil moisture in the 0-30 sm driving layer was 20.2% in the driving layer, which was considered optimal for seed germination and obtaining a flat seedling. In subsequent observations, this figure averaged 19.0%, 17.5%, and 15.1%, respectively, and it was observed that the soil moisture during the growing season was sufficient for plant growth and yield. Soil moisture varied from

21.7% to 16.5% in the 0-50 sm layer from sowing to ripening, and in the 0-100 cm layer from 24.1% to 17.4%, respectively. It was found that this figure decreased from 22.3% to 18.2% in the 0-150 cm layer of soil.

Thus, when planting mung bean as a repeat crop in areas free of winter wheat, soil moisture averages 5.1% in the 0-30 sm layer and 5.2% in the 0-50 sm layer from the beginning to the end of the growing season, ie from the day of the first observation to the date of the last observation. , Decreased by 6.7% in the 0–100 sm layer and by 4.1% in the 0–150 sm layer. This allowed the mung bean to ripen with the reserve water given, although the moisture gradually decreased during the growing season.

As a result of the efficient use of natural moisture in the soil during the growing season, there was no need for additional irrigation for seed germination, accelerated plant growth and development, and high yields.

Therefore, the cultivation of mung bean in the autumn wheat field with reserve water during the second half of the summer is a convenient and promising measure in conditions of limited water supply.

Table 3.3.2
Experimental field soil moisture dynamics during the growth of mung bean planted in the pit,%

Soil layer, sm	Periods in which soil moisture is determined											
	1.07.			15.07.			1.08.			15.08.		
	1- point	2- point	Average	1- point	2- point	Average	1- point	2- point	Average	1- point	2- point	Average
0-10	19,3	20,4	19,8	17,6	18,3	17,9	15,7	16,0	15,8	13,8	13,1	13,4
10-20	20,8	19,6	20,2	18,4	20,0	19,2	18,6	17,3	17,9	16,5	15,7	16,1
20-30	19,8	21,6	20,7	20,4	19,4	19,9	19,2	18,5	18,8	15,4	16,7	16,0
30-40	23,4	22,5	22,9	19,3	21,1	20,2	19,9	18,6	19,2	18,7	17,9	18,3
40-50	22,7	24,5	23,6	21,4	20,4	20,9	20,3	19,2	19,7	19,9	18,5	19,2
50-60	21,1	23,0	22,0	23,0	22,5	22,7	21,8	17,6	19,7	20,4	19,4	19,9
60-70	22,3	22,4	22,3	22,1	20,6	21,3	19,6	20,0	19,8	18,3	15,7	17,0
70-80	20,6	21,6	21,1	21,6	21,4	21,5	20,8	19,4	20,1	17,5	16,4	16,9
80-90	21,3	24,0	22,6	22,4	22,1	22,2	21,4	18,6	20,0	19,4	18,0	18,7
90-100	24,1	23,5	23,8	20,0	20,3	20,1	20,0	21,1	21,2	20,1	17,6	18,8
100-110	23,2	21,8	22,5	23,1	22,5	22,8	21,8	20,6	21,2	22,4	19,6	21,0
110-120	21,8	22,0	21,9	21,4	20,6	21,0	19,4	20,8	20,1	19,8	15,8	17,8
120-130	22,5	23,6	23,0	20,2	21,9	21,0	19,6	22,4	21,0	20,4	18,4	19,4
130-140	23,4	24,0	23,7	22,6	22,7	22,6	22,1	21,9	22,0	21,6	20,4	21,0
140-150	24,7	25,1	24,9	23,1	23,3	23,2	22,7	21,7	22,2	20,4	19,7	20,0
Average												
0-30	19,9	20,5	20,2	18,8	19,2	19,0	17,8	17,3	17,5	15,2	15,1	15,1
0-50	21,2	21,7	21,4	19,4	19,8	19,6	18,7	17,9	18,3	16,7	16,4	16,5
0-100	24,1	22,3	23,2	20,6	20,6	20,6	19,7	18,6	19,1	18,0	16,9	17,4
0-150	22,0	22,6	22,3	21,1	21,2	21,1	20,7	19,6	20,1	18,9	17,5	18,2

Thus, in the conditions of typical irrigated gray soils of Kashkadarya region, the agro-physical processes that determine soil fertility are improved as a result of the cultivation of winter wheat in different periods and norms.

3.4. Agrochemical properties of experimental field soils

In order to get a high yield from crops, it is necessary to provide them with the necessary conditions for their life, that is, nutrients in addition to light, heat and water. the normal growth, development, and yield of mung bean depend on the nutrients in the soil.

According to many experiments conducted by H.N. Atabaeva [20], legume-grain crops - soybeans are sown as early crops as early crops and fed with 100 kg / ha of phosphorus and 50 kg / ha of potassium, the grain yield is 2.03 -2.32 t / ha.

According to G. Urinbaeva's experiments, when legumes are sown with mung bean, beans and soybeans and fed with 75 kg / ha of nitrogen, 75 kg / ha of phosphorus and 50 kg / ha of potassium, the grain yield is 1.55. , 1.27., 2.3.3 t / ha.

Khoshimov I.N., Sarimsoqov MM, Rajabov T. [120] noted that in the conditions of barren soils of the Karshi steppe, high grain yields (1.73-2,14 t / ha) and hay (5.42-6.01 t / ha) were obtained during the season from mung bean sown as a secondary crop. Feeding with 120 kg of nitrogen, 150 kg of phosphorus and 60 kg of potassium per hectare, zigzag irrigation 2-3 times depending on the weather is advisable.

Phosphorus fertilizers also play an important role in the nitrogen accumulation of legumes. Therefore, in order to ensure the full participation of phosphorus fertilizers in this process, it is necessary to plant legumes as early as possible, paying close attention to seedling thickness [88].

Before conducting an experiment, it is necessary to know the level of nutrient availability of the experimental field. (Table 3.4.1).

At the same time, low and medium nitrogen-rich lands in the country increased by 18%, while high-nutrient lands decreased by 8-10%. Areas with low and moderate levels of phosphorus increased by 19% and areas with high levels of phosphorus decreased by 14%. Irrigated lands with very low supply of exchangeable potassium increased by 10%, while areas with medium and high levels of supply decreased by 20-25%.

Table 3.4.1
Level of mobile nutrient supply of soil, mg / kg

Level of provision	$N\text{-}NO_3$	P_2O_5	K_2O
Very few	0-20	0-15	0-100
Less	21-30	16-30	101-200
Average	31-50	31-45	201-300
High	51-60	46-60	301-400
Very high	61<	61<	401<

According to the data obtained, the amount of humus in the driving layer (0-30 cm) before planting in the experimental field was 1.020% in the first year, 1.021% in the second year, and 1.020% in the third year. ; 1,016%; Was 1.016%.

The amount of mobile phosphorus in the soil in the first year of the experiment was 32.0 mg / kg in the driving layer of the soil (0-30 sm), in the second year 34.0 mg / kg, in the third year 33.0 mg / kg, and in the driving layer 29.0, respectively. ; 32; It was observed that 30 mg / kg. The amount of exchangeable potassium is also 310, 305, respectively, by years and soil layers; 320 and 314; 319, 312 mg / kg. Apparently, the soil is moderately and well supplied with nutrients.

According to the data obtained at the end of the application period, it was observed that the amount of humus in the tested soils retained the initial amount. According to 2001 data, the amount of humus in the drive layer of the soil was found to be 1,020% at the beginning of the application period and 1,024% at the end of the application period. Decreased levels of mobile phosphorus and exchangeable potassium in the soil were observed. For example, at the beginning of the application period, these values were 32, 29 mg / kg and 310, 305 mg / kg, respectively, for the soil layers, while at the end of the application period, they were 26, 20 mg / kg and 291, 279 mg / kg, respectively. were observed to decrease by 6.0, 9.0, and 19, 26 mg / kg, respectively (Table 3.4.2).

The increase in the amount of humus in the soil as a result of the cultivation of mung bean in the soil is explained by the fact that the root system is very rich in organic matter, quickly absorbed by the microorganisms around the roots and converted into humus.

The root extracts of mung bean and other legumes are rich in nitrate, mobile phosphorus, and exchangeable potassium, but in the soil they react with substances that are difficult for plants to assimilate, making them easily assimilated [28].

Therefore, although legumes, especially mung bean, are very demanding on phosphorus and potassium fertilizers, no drastic decrease in phosphorus and potassium levels in the soil has been observed as a result of mosquito root nodule bacteria activating phosphorus, potassium and other nutrients to be easily absorbed by plants.

For example, in the case of winter wheat, when the mung bean is grown at different times and in different norms, the amount of mobile phosphorus in the topsoil (0-30 sm) is on average 5 mg / kg, and in the bottom layer (30-50 sm) 9 mg / kg, the amount of exchangeable potassium 21 mg / kg in the driving layer (0-30 sm) and 30 mg / kg in the underlying layer (30-50 sm) were found to be reduced compared to the initial state. This is because all the phosphorus fertilizers used react with the soil solution by the end of the growing season of the mung bean without being immediately absorbed by the crops and become difficult to dissolve. Under the influence of root secretions, the mung bean plant again becomes able to assimilate the plant. Therefore, the amount of mobile form of phosphorus does not change dramatically.

It is known that any agricultural crop removes significant amounts of nutrients from the soil during the application period. After harvest, a certain amount of nutrients are returned to the soil as organic matter through the root system (residual stem and root). In addition, some roots of crops planted as a secondary or intermediate crop become organic during the application period.

Table -3.4.2
Agrochemical properties of the experimental field
(Typical gray soils of Kashkadarya region)

№	Indicators	Soil layers, sm			
		0-30	30-50	0-30	30-50
		before planting		at the end of the validity period	
2001					
1	Humus, %	1,020	1,015	1,024	1,018
2	Mobile phosphorus, mg / kg	32	29	26	20
3	Exchangeable potassium, mg / kg	310	305	291	279
2002					
1	Humus, %	1,021	1,016	1,025	1,018
2	Mobile phosphorus, mg / kg	34	32	28	22
3	Exchangeable potassium, mg / kg	320	314	293	281

2003					
1	Humus, %	1,020	1,016	1,025	1,018
2	Mobile phosphorus, mg / kg	33	30	27	21
3	Exchangeable potassium, mg / kg	319	312	295	280

.The research revealed the roots and root residues left by winter wheat and replanting mung bean in the soil, as well as the total amount of nitrogen, phosphorus and potassium in them (Table 3.4.3).

In the experimental field, 3.02 t / ha of root and root residues from winter wheat remained in the soil. According to the sowing dates, 1.14-1.28 tons of root and root remnants are found in the replanted mung bean. An average of about 4.30 tons of root and dung remains in the soil per year.

Table-3.4.3

Root and root remnants left in the soil by winter wheat and repeated sowing, as well as the total amount of nitrogen, phosphorus and potassium in them

№	Crop types and options	Root and mouth residue, t / ha	The total amount is in percent		
			Nitrogen	Phosphorus	Potassium
1	Autumn wheat	3,02	0,437	0,291	0,677
2	Mung bean (1.07.)	1,28	1,204	0,432	0,311
3	Mung bean (15.07.)	1,25	1,197	0,428	0,307
4	Mung bean (1.08.)	1,14	1,194	0,424	0,303

When determining the total amount of nitrogen, phosphorus, potassium in the root and root residues that remain in the soil, we obtained the following information:

- total of 0.437% nitrogen, 0.291% phosphorus, 0.677% potassium in the root and stalk residues left after winter wheat;
- in the first ten days of July (1.07.) in the field of root and anchovy residues sown 400 thousand mung bean seeds per hectare, a total of 1.204% nitrogen, 0.432% phosphorus, 0.311% potassium;
- in the second ten days of July (15.07.) in the composition of the roots and remains of the field sown 400 thousand seeds of mung bean per hectare, a total of 1.197% nitrogen, 0.428% phosphorus, 0.307% potassium;

In the first ten days of August (1.08), 400,000 pieces of mung bean seeds per hectare were sown in the fields, which contained a total of 1.194% nitrogen, 0.424% phosphorus and 0.303% potassium.

This means that when 400,000 seeds per hectare are sown in early July as a repeat crop, it will increase soil fertility and have a positive effect on the yield of subsequent crops, leaving 0.10-0.14 tons more roots and dung residues in the soil than in the late sowing options.

According to the results of experiments conducted by Iminov AA [43], at the end of the growing season of winter wheat left an average of 1.41 t / ha of stalks, 2.40 t / ha of root residues, and 0.80 t / ha of replanting. left 1.36 t / ha of root remnants. It was found that 0.98 t / ha of dung and 1.75 t / ha of root residues were left from the soy bean planted as a secondary crop. Analysis of the total amount of manure and root residues left by the crops in the experimental variants showed that the highest scores were 2- (autumn wheat + repeat crop (mung bean): cotton, 1: 1) and 3- (autumn wheat + repeated crop (soy bean) of the experiment: cotton, 1: 1) variants, in which for a total of 1 year the plants left 2.21–2.39 t / ha of root and 3.76–4.15 t / ha of root residues.

The lowest rate was experimentally controlled, i.e. 1: 1, winter wheat + black plough: in option 1 in the form of cotton, 1.41 t / ha of sorghum and 2.40 t / ha of root residues were found.

It can be seen that as a result of planting legumes as a secondary crop in crop rotation systems, 5.97 to 6.54 tons of organic waste per hectare is accumulated during the year. This in itself has a positive effect on the increase in the amount of humus in the soil, improving the macro and microstructure of the soil, as well as its physical and water-physical properties.

It was also observed in the experiment that the seeds of mung bean sown as a secondary crop were treated with nitragin before sowing and the effect of the norm of mineral fertilizers used in the care of mung bean on the agrochemical properties of the soil was observed. At the end of the growing season, mung bean seeds are treated with nitragin before sowing, and the application of mineral fertilizers in different doses has an effect on the amount of humus in the soil. The amount of humus in the soil in the driving layer of the soil (0-30 sm) was 0.827% in the non-fertilized variant treated with nitrogen before sowing the seeds of mung bean, while in the background treated with nitrogen NPK 30:90:60 kg of mineral fertilizers / ha was 0.859% in the applied variant. This ensured that the amount of humus in the soil increased by 0.031% compared to the initial figures.

The total nitrogen content of the soil in the driving (0-30 sm) layer of the soil was 0.076% in the fertilized variant without any mineral fertilizers before sowing the seeds of mung bean, while in the nitrogen-treated background mineral fertilizers NPK 30:90: The norm of 60 kg / ha was 0.086% in the applied variant. At the same time, the amount of nitrogen increased by 0.012% compared to the initial figures. The same laws have been observed for the total phosphorus and mobile potassium in the soil [45].

In the conditions of typical gray soils of Tashkent region in short-rotation crop rotation systems [108] for several years in the winter wheat field were planted cereals and legumes, the effect on soil fertility was studied. Root and root remnants left by the plants in the soil and the amount of nutrients they contain were also determined.

In long-term experiments, the amount of root and root residues left by each plant in the soil at the end of each application period was studied up to a 0-50 sm layer of soil. According to data from studies of typical gray soil conditions, at the end of the winter wheat application period, on average, 1.18-1.65 t / ha of manure, 2.18-2.66 t / ha of root residues were left, while the repeated mung bean was 0, 64-0.95 t / ha left root remnants, 1.17-1.94 t / ha root.

Analyzes of the total amount of manure and root residues left in the study variants showed that the highest rates were obtained in variant 5 of the experiment (autumn wheat + repeat crop (mung bean): winter wheat + repeated crop (mung bean): cotton, 2: 1) and 6- in the variant (autumn wheat + repeated crop (mung bean): autumn wheat + repeated crop (mung bean) + intermediate crop (rye): cotton, 2: 1) with a total of 12.93-16.80 t / e left roots and stalks or organic residues. A small amount of organic residue was found in variant 3 of the study (cotton: winter wheat + repeat crop + intermediate crop (rye): cotton, 1: 1) and in variant 4 (cotton + intermediate crop (rye): cotton: winter wheat + repeated crop) mung bean 1: 1) was observed at -8.89-8.44 t / ha. The lowest value was determined in the 1st control (3.42 t / ha) in the experimental control, i.e. 1: 1, cotton: autumn wheat: cotton appearance.

According to the data from a second study, at the end of the growing season, winter wheat yielded 1.14-1.45 t / ha, root 2.11-2.73 t / ha, repeated mung bean 0.66-0.74 t / ha, 1 , 57-1.68 t / ha root, intermediate crop triticale 1.14-1.38 t / ha root, 2.07-2.58 t / ha root residue, leaving the largest amount of root and The amount of fertilizer was observed in variant 4 (1: 1: 1, winter wheat + repeated crop (mung bean) + intermediate crop (triticale): cotton + intermediate crop (triticale): soybean) -16.09 t / ha. In the 5th variant of the study (1: 1: 1, winter wheat + tak.ek + intermediate crop: shade: cotton) and in the 6th variant (autumn wheat + repeated crop (mung bean): cotton + intermediate crop (triticale): soy) these figures were 12.09-11.68 t / ha, respectively.

It can be seen that in crop rotation systems, 8 to 16 tons of organic waste per hectare is accumulated over three years as a result of replanting legumes as a crop. This in itself has a positive effect on the increase in the amount of humus in the soil, the improvement of the macro and microstructure of the soil, as well as its physical and water-physical properties.

As mentioned above, any crop takes with it different amounts of nitrogen, phosphorus and potassium elements from the soil. If some of these extracted elements are lost along with the crop, some are lost due to the harvested stem composition. However, these elements can also return at the expense of plant debris left in the soil, especially at the root remains.

In order to clarify the matter, the amounts of nitrogen, phosphorus and potassium in the roots and stems of plants were analyzed in the laboratory. According to the data, 100 g of dried root of winter wheat contains 0.416% nitrogen, 0.157% phosphorus, 0.217% potassium, and 0.24% nitrogen, 0.126% phosphorus, 0.146% potassium in the root part, 100 g of dried root mass of legumes containing NRK 1.46% (N) -1.0% (R2O5) -1.05% (K2O) and 1.29% (N) -0.32 (R2O5) -1.6%, respectively. K2O), NRK 1.29% (N) -0.37% (R2O5) -0.6% (K2O) in the root part of the soybean, 0.46% (N) -0.2% (R2O5) in the root - The presence of 0.75% (K2O) element was observed, while the intermediate crop triticale root content was 0.363-0.145% and the root content was 0.277-0.107%.

When the data obtained are multiplied by the amount of plant and root residues in the plant, it is known how much nitrogen, phosphorus and potassium are returned to the soil through the root and root parts.

According to the data obtained, the rotation is 1: 1: 1 (5, 6 var) winter wheat + repeat crop (mung bean) + intermediate crop (triticale): shade: cotton, winter wheat + repeated crop (mung bean): cotton + intermediate crop (triticale): In soybean units, it has been observed that the highest amounts of nitrogen, phosphorus, and potassium are returned to the soil through the roots and roots for three years. In these variants, the indicators for winter wheat were N-50.4-50.2 kg, R2O5-22.5-22.6 kg, K2O-28.9-29.0 kg / ha, respectively. N-135.5-138.8, R2O5-65.0-66.6, K2O-133.1-136.3 kg / ha, and intermediate crops - rye N-24.2, R2O5- 9.5 kg / ha.

100 g of dried stalks of mung bean planted as a second crop after winter wheat contains 0.40-0.45% nitrogen, 0.60-0.63% of horns, 0.70-0.73% of

legumes, 1 grain. , 08-1.11%; phosphorus content was 0.20-21% -0.25-0.27% -0.16-0.18% and 0.70-0.75%, respectively; potassium content was found to be around 1.0-1.05% -0.55-0.60% -0.70-0.75% and 1.30-1.35%, respectively.

According to the results of calculations on the chemical elements assimilated by the plant (except for roots and stalks residues) through the available chemical elements per 100 g of dry mass of each plant, the total content of winter wheat stalks, leaves, spikes, grains is 4.91-5.36 g. amount of nitrogen, 2.4-2.9 g. phosphorus, 6.23-7.06 g. was found to absorb potassium. If these figures are multiplied by the mass and amount of straw and grain per hectare, in general, the area above the ground, from sowing to harvesting 150-160 kg of nitrogen per hectare, 70-80 kg of phosphorus, 180-200 kg of potassium per hectare. assimilation was determined.

The above-ground vegetation organs of the mung bean plant, which are repeatedly planted after winter wheat, are 24.5-26.0 g of nitrogen, 15.1-16.3 g of phosphorus per 100 g of dry mass of each organ of the stem, leaf, horn, legume, grain, 34 , 1-36.6 g of potassium, 71.6-80.1 kg of nitrogen per hectare, 45.5-49.5 kg of phosphorus, 100.5-113.5 kg of potassium per hectare.

The following data were obtained when the chemical elements assimilated only by cereals and legumes during one rotation (3 years) in the cotton-grain units of crop rotation were obtained.

In the 1: 1 rotation crop, cotton: wheat: 145.2 kg N, 71.8 kg R2O5, 175.6 kg K2O were assimilated by winter wheat in the cotton system, while in the same system after sowing of wheat, these values were NRK 221.8. -121.9-286.5 kg, or cotton: wheat + secondary crop (mung bean) + intermediate crop: in the cotton system, respectively, NRK 320.1-149.1-479.7 kg of nutrients were found to be assimilated. In the study, the maximum nutrient uptake was observed in option 6, (2: 1, winter wheat + repeat crop (mung bean): winter wheat + repeated crop (mung bean) + intermediate crop (rye): cotton) indicators NRK 560.6-282,2-776.6 kg / ha. formed.

It should be noted that all of the above information is the part of plants that is mainly assimilated by the surface organs. Excluding the amount of root and stem residues left by plants in the soil and the amounts of N, R2O5 and K2O in them.

From these data, as well as taking into account the mineral fertilizers given during the care of plants, the amount and balance of nitrogen, phosphorus and potassium elements left in the soil after the end of rotation in crop rotation systems were calculated.

According to the data obtained, the maximum amount of nitrogen in the soil after the end of the rotation in the crop rotation system is in option 5 of the study, i.e. 2: 1, winter wheat + repeat crop (mung bean) winter wheat + repeated crop (mung bean): cotton and 2: 1, autumn wheat + repeat crop (mung bean) autumn wheat + repeated crop + intermediate crop (rye): cotton (option 6) was observed to be left. At the same time, these figures are 145.2 kg per hectare in option 5. ni, and in variant 6, 132.6 kg. formed. In variants 2, 3, and 4 of the study, 72.1; 44.5; Was 35.8 kg (Table 11).

According to another study, even when winter wheat was planted in a single field, it left 57.8 kg of nitrogen per hectare for three years. The highest rate was observed in variant 5 of the experiment, i.e. 1: 1: 1, winter wheat + repeat crop (mung bean) + intermediate crop (triticale): shade: in the cotton system - 134.7 kg (Table 12).

Rotational sowing 2: 1, winter wheat + repeat crop (mung bean): winter wheat + repeated crop (mung bean): cotton or autumn wheat + repeated crop (mung bean): autumn wheat + repeated crop (mung bean) + intermediate crop (rye): cotton and 1: 1: 1, winter wheat + repeated crop + intermediate crop (triticale): shade: after one rotation in cotton systems, 185-215 kg of biological nitrogen accumulates in the soil.

Based on the above data, it can be concluded that the composition of agricultural crops has changed, crop rotation systems have changed, short-rotation cotton-grain crop rotation systems are used in farms. on average, from 8 to 16 tons of organic waste per hectare, and thus in the soil in the amount of 155.2-213.2 kg / ha of biological nitrogen, 64.2-98.6 kg / ha of phosphorus, 112.8-165.2 kg / ha provides an element of potassium in the amount.

This will further increase the amount of humus in the soil, improve the macro and microstructure of the soil and ensure a positive impact on the physical and water-physical properties of the soil.

3.5. Microbiological properties of soil

Soil fertility and effective properties are inextricably linked with the development and activity of soil microorganisms.

Microorganisms are actively involved in soil processes with high biochemical energy. They carry out the basic biological process in the soil, breaking down organic residues and forming new organic matter humus. In addition, by using plant residues in the life process, it creates the conditions for optimal growth and development of the crops grown by cleaning the environment.

The role of microorganisms in the soil in the formation of humus in the soil and the transition of chemicals necessary for the plant to a state that can be assimilated by the plant is invaluable.

From the complex organic compounds of nitrogen in the soil, various amino acids are formed under the influence of microorganisms, and these substances are assimilated by microorganisms. Some of the amino acids are broken down as a result of the activity of microorganisms in the soil, releasing ammonia.

Ammonia, which is formed from the decomposition of organic matter in the soil, becomes food for plants, another part of which is converted to nitric acid, which forms nitrates in the soil. Nitrates are a source of plant nutrition.

If the soil is soft and there is enough moisture, temperature and air for the plants, the nitrification process will accelerate.

When the above-mentioned natural factors are not sufficient in the soil, the process of nitrogen compounds decomposes and the formation of free nitrogen in the gaseous state takes place. This process is carried out by special microorganisms in the soil, denitrifiers. However, some of the free nitrogen formed as a result of this process is returned in the form of nitrogen oxides and ammonia along with atmospheric precipitation.

Life on our planet is maintained by two main processes - the creation of new organic matter through photosynthesis and their subsequent gradual decomposition. The first is mainly carried out by higher plants, and the second by microorganisms in the soil. The formation and dynamics of soil biochemical, nutrient, air regimes are closely related to the activity of microorganisms. All this indicates that microorganisms are very important in the development of soil fertility [4].

An increase in the amount of oligonitrophilic microorganisms in short-rotation crop rotation leads to a greater accumulation of carbon-containing organic compounds, while a decrease in the pedotrophthyl index and denitrifying microorganisms leads to a lower loss of nitrogen-containing compounds.

Some actinomycetes are able to accumulate nitrogen in the atmosphere. Soils are not only rich in actinomycetes, but also contain different species of these microorganisms. The amount of actinomycetes decreases from the top layers to the bottom.

Indeed, when the agrophysical, water, water-physical properties of the soil are normal, the movement of microorganisms in it becomes more active, resulting in increased soil fertility. When the soil is cultivated, there are always favorable conditions for the development of actinomycetes and mold fungi and their conversion of organic matter into minerals. As a result, there are many nutrients in the soil solution that plants can absorb, and yields increase. Therefore, it is important to study the extent and scope of the impact of planting norms and timing of mung bean planted as a secondary crop on the activity of microorganisms in the soil.

Microbiological analysis was conducted at the Research Institute of Microbiology under the Academy of Sciences. Microbiological analyzes were performed in three replicates using the generally accepted methodological method of elective feeding

In the microbiological analysis, the main important soil microorganisms were studied. These soil aminoficifiers and microorganisms are actively involved in the metabolism of nitrogen, phosphorus, potassium and carbon.

Oligonitrophils, i.e., bacteria, actinomycetes, and micromycetes involved in phosphorus metabolism, are mainly distributed in the drive (0–30 sm) layer of the soil. Proteins, which make up 50% of the cell's dry residue, decompose rapidly in the soil. Proteins are mainly broken down by ammonifiers, actinomycetes, micromycetes (fungi). This process is called ammonification.

The ammonification process is important in plant nutrition. Oligonitrophil bacteria have the ability to convert atmospheric nitrogen and humus-containing carbon into a form assimilated by the plant. Their accumulation in the soil causes it to be enriched with nitrogen. A comprehensive study of microorganisms belonging to this category is important in increasing soil fertility.

Phosphorus-absorbing microorganisms convert mineral and organic phosphorus into a form that is absorbed by the plant.

Potassium-absorbing fungi, on the other hand, convert difficult-to-assimilate potassium compounds into potassium-aluminosilicates, which are assimilated by plants.

Micromycetes contain phytopathogenic fungi that cause damage to agricultural crops by various diseases and conversely aminomycetes cause disease eradication. Microbiological analyzes showed that the amount of ammonifiers in the studied soil samples was acceptable at both the beginning and end of the season.

Bacteria that assimilate phosphorus and potassium were not found at the beginning of the application period in the soil samples studied. At the end of the validity period, however, some options were not identified. In other words, no phosphorus-absorbing bacteria were detected in the variants sown at the rate of 260-330 thousand seeds per hectare in all three periods.

In all soil samples studied, the amount of oligonitrophils was found to be one step below the acceptable norm.

Micromycetes (microscopic fungi) were found to be acceptable at 3 points at the beginning of the season and at all three periods at the end of the season, with 460,000 seeds per hectare.

The results of the analysis showed that actinomycetes were not found in some samples at the beginning and end of the season, but in some samples they were 1-3 points lower than the acceptable norm.

Ammonifiers and oligonitrophil counts were higher when mung bean was planted in mid-July than in early and late planting periods in all planting norms (Table 3.5.1).

When the agrophysical, water, water-physical properties of the soil are normal, the movement of microorganisms in it becomes more active, resulting in increased soil fertility. Therefore, it is important to study the extent and scope of the impact of crop rotation on the activity of microorganisms in the soil.

Table-3.5.1
Microbiological properties of experimental field soil (KOE / g)

Sowing time	Planting rate, kg	Layer, sm	Ammonium fixatives	Absorbing phosphorus	Oligonitrophils	Micromycetes	Actinomycetes
At the beginning of the validity period,		0-30	$4,2x10^8$	Not detected	$5,9x10^6$	$2,2x10^4$	Not detected
At the end of the validity period							
1.07	**260 (control)**	0-30	$3,4x10^8$	Not detected	$3,7x10^6$	$3,0x10^5$	Not detected
	330	0-30	$3,3x10^8$	Not detected	$4,5x10^6$	$3,0x10^4$	$7,5x10^3$
	400	0-30	$3,7x10^8$	$1,5x10^6$	$7,9x10^6$	$1,5x10^5$	$2,2x10^5$
	470	0-30	$3,5x10^8$	$1,5x10^6$	$5,5x10^6$	$4,0x10^4$	$7,5x10^3$
	540	0-30	$5,6x10^8$	$1,5x10^6$	$7,5x10^6$	$1,5x10^5$	$7,5x10^3$
15.07	**260 (control)**	0-30	$5,1x10^8$	$1,5x10^6$	$9,0x10^6$	$1,5x10^4$	$7,5x10^3$
	330	0-30	$4,9x10^8$	Not detected	$6,0x10^6$	$7,5x10^4$	Not detected
	400	0-30	$5,6x10^8$	$1,5x10^6$	$7,5x10^6$	$1,5x10^5$	$7,5x10^3$
	470	0-30	$3,5x10^8$	$1,5x10^6$	$5,5x10^6$	$4,0x10^4$	$7,5x10^3$
	540	0-30	$4,6x10^8$	$1,5x10^6$	$5,5x10^6$	$1,5x10^5$	$6,5x10^3$
1.08	**260 (control)**	0-30	$4,7x10^8$	Not detected	$9,0x10^6$	$1,5x10^5$	$7,5x10^4$
	330	0-30	$4,2x10^8$	Not detected	$7,9x10^6$	$7,5x10^3$	Not detected
	400	0-30	$3,7x10^8$	$1,5x10^6$	$1,0x10^7$	Not detected	Not detected
	470	0-30	$3,0x10^8$	$1,5x10^6$	$4,5x10^6$	$4,0x10^4$	$5,5x10^3$
	540	0-30	$3,6x10^8$	Not detected	$4,5x10^6$	$1,5x10^5$	$5,5x10^3$
An acceptable norm in the soil		0-30	$n x 10^8$	$n x 10^{7-8}$	$n x 10^7$	$n x 10^{2-3}$	$n x 10^{5-6}$

Thus, the use of crop rotation systems, ie the cultivation of mung bean as a repeated legume-grain crop, has created favorable conditions for maintaining and increasing soil fertility as a result of the creation of a favorable environment for microorganisms.

3.6. Mung bean seed germination rate and vegetation period duration.

Due to the fact that mung bean is a heat-loving, short-lived plant, the germination period is very short and it ripens 15-25 days faster than when planted in spring [8].

Under the influence of air temperature and humidity, the growth period of the mung bean varies from 10 to 25 days. In addition, the vegetation period of the mung bean varies depending on the location of the cropland in altitude and latitude above sea level. For this reason, in the conditions of the northern regions, the growth period of the mung bean is much longer. Because mung bean is a short-day crop, the growing period is shortened if planted late.

This situation requires the determination of the timing and norms of mung bean cultivation in the region after the harvest of winter wheat in each region.

Because mung bean is a thermophilic plant by its biological properties, the optimum temperature for seed germination may be + 250S and above. However, excessive moisture in the soil when sowing mung bean seeds has a negative effect on germination. Mung bean seeds germinate in a very short time after sowing, requiring 90-92% moisture relative to their weight [81].

Although mung bean seeds germinate evenly when sown in the fall wheat field during the summer when the air temperature is high, they are in proportion to the sowing times and norms.

For this reason, when mung bean is grown as a secondary crop in the winter wheat field, its sowing dates and norms should be determined in the soil and climatic conditions of each region. Data on germination of mung bean seeds sown in the furrow at different times and in different norms are given in Table 3.6..1.

According to data obtained in 2001 on the germination of mung bean, the planting of mung bean at different terms and norms affected its germination. Mung bean was 11.9-15.4% on the sixth day after sowing on July 1, and 11.8-13.5% on the sixth day after planting, and 9.7-11.5% a month later. %. On the ninth day after mung bean planting, these figures were 42.5–56.7, respectively; 41.2-47.6; It was observed that it was 38.1-45.6%.

In 10-12 days after sowing, the sown mung bean was fully germinated and made up 94.0-96.8%. Thus, in the conditions of typical gray soil zone of the foothills of Kashkadarya region, the germination rate is faster when mung bean seeds are sown in winter wheat in early July (1.07), and more stable when sown in early August.

Table-3.6.1

Growth rate of mung bean planted in the mouth at different times and standards,%

Sowing dates	Planting norms, thousand pieces / ha	2001 y			2002 y			2003 y		
		6.07	9.07	12.07	6.07	9.07	12.07	6.07	9.07	12.07
1.07	260 (control)	11,9	42,5	94,3	14,2	49,1	95,8	9,8	39,4	94,2
	330	12,6	42,5	95,2	15,1	51,0	95,9	10,4	41,3	94,3
	400	13,1	44,7	95,8	16,3	55,3	96,3	11,1	44,5	95,0
	470	15,1	49,9	95,0	17,0	59,7	96,5	11,5	47,4	95,3
	540	15,4	56,7	96,6	17,4	65,8	97,7	13,8	51,2	96,0
15.07		21.07	24.07	27.07	21.07	24.07	27.07	21.07	24.07	27.07
	260 (control)	11,8	41,2	93,1	13,5	44,1	95,3	10,7	41,0	93,6
	330	12,3	41,7	93,5	14,6	47,3	95,5	11,3	41,8	94,0
	400	12,7	42,7	94,7	14,8	50,2	95,8	11,7	42,9	94,3
	470	13,1	43,1	95,0	15,1	54,5	96,0	12,1	43,5	95,3
	540	13,5	47,6	95,5	15,8	57,6	96,6	12,7	47,5	95,8
1.08		6.08	9.08	12.08	6.08	9.08	12.08	6.08	9.08	12.08
	260 (control)	9,7	38,1	92,0	11,6	48,6	95,0	8,5	37,0	93,1
	330	10,3	41,5	92,8	12,6	50,2	94,0	9,2	38,7	93,9
	400	10,8	42,9	94,0	12,7	51,4	94,4	9,6	39,3	93,6
	470	11,1	43,3	94,3	13,2	52,8	94,8	10,0	41,4	94,3
	540	11,5	45,6	94,8	13,5	53,3	95,6	10,3	43,8	94,6

Also, the planting norms of the mung bean also had an impact on its germination. According to the data obtained, the germination rate of mung bean was high as the planting rate was increased. In the 6th and 9th days after sowing, the germination rate was 15.4-56.7%, respectively, in the variant of 540 thousand mung bean per hectare on July 1, while in the case of sowing 470 and 400 thousand mung bean per hectare, these figures were 15.1-49.9% and 13.1–44.7%, respectively, i.e., germination rates were observed to be higher in variants with a higher sowing rate than in low-sowing variants, regardless of the mung bean planting dates. However, it should be noted that the germination rate of mung bean decreased as the sowing period was delayed. This situation can be attributed to the fact that the temperature in August is slightly lower than in July, depending on the heat-loving properties of the mung bean.

When mung bean seeds are sown in the fall wheat field, the germination period passes in very short periods of time at high temperatures, but the duration of the growing season also changes due to changes in air temperature, i.e., overheating and high response to day shortening.

Because mung bean is a short-day plant, the growing season is significantly shorter than when planted in the spring, adapting to the shortening of the day when it is grown as a repeat crop in the fall wheat field.

In the Tashkent region, the vegetation period was 113 days when sown on May 2, 91 days when sown on June 1, 81 days when sown on June 15, and 76 days when sown on July 1 [8].

In another experiment in Tashkent region, the vegetation period was 100 days when sown on April 15, 95 days when sown on May 5, 90 days when sown on June 15-18, and 83 days when sown on July 5. However, in the southern regions of the country it is natural to reduce the duration of the growing season due to high temperatures when growing winter wheat in the autumn. For this reason, it is important to study the effect of planting times and norms on the duration of the growing season of mung bean grown as a secondary crop in the fall wheat field.

According to the experimental data, the duration of the vegetation period of the mung bean planted in the winter wheat field at different times and norms varied depending on the sowing periods and norms. In the experiment, the vegetation period when sown in early summer as a repeat crop to mung bean continuous (83–87 days) and shorter (73–77 days) were observed when planted later (Table 3.6.2).

First of all, it should be noted that the duration of the growing season varies depending on the timing and norms of sowing, adapting to the shortening of the day of mung bean grown in the field. Depending on the sowing norms, the duration of the vegetation period was 83-87 days when sown on mung bean winter wheat on July 1, 76-81 days when sown on July 15, and 73-77 days when sown at 1.08. That is, mung bean was reduced by 6-7 days when planted on July 15 compared to July 1, and by 10 days when planted on August 1 compared to July 1. This can be explained by the fact that mung bean is a short-day crop and is associated with a shortening of the day as a result of its adaptation to photoperiodic reactions.

According to the data on the dependence of the growing season on winter wheat, 260,000 seeds per hectare were sown in early July, compared to 83 days, and 70,000 seeds were sown. It was observed that the duration of the growing season increased from 1 to 4 days, ie the duration of the growing season increased by one day due to the increase of 70,000 seeds of mung bean per hectare.

The difference in the length of the growing season of mung bean grown in the fall wheat field can be seen as a shortening of the day at the end of the growing season. Because on September 20-22, the day shortens and day equals night, there is an acceleration of the ripening process in response to the light reaction of mung bean and other repeat crops. For this reason, the vegetation period is continuous when planting mung bean, and a slight shortening of the growing season is observed when planting late.

This means that the duration of the growing season is 83-87 days, depending on the thickness of the seedlings, when sown in early July, mung bean sown in autumn wheat is reduced to 6-7 days in mid-July, and 10 days when sown in early August.

Table 3.6.2
Dependence of the duration of the growing season of mung bean grown in the mouth on the timing and norms of sowing, days

Sowing dates	Planting norms, thousand pieces / ha	Germination - 6 leaves	6 leaves - buds	Bud - flowering	Flowering - fruiting	Fruit formation - moderate ripening	Average cooking - full cooking	Vegetation period
1.07	260 (control)	22	8	6	11	16	20	83
	330	22	8	6	12	16	20	84
	400	23	8	6	12	16	20	85
	470	23	8	6	12	17	20	86
	540	23	8	6	12	17	21	87
15.07	260 (control)	22	8	6	9	14	17	76
	330	23	8	6	9	14	18	78
	400	23	8	6	10	14	18	79
	470	23	8	6	10	15	18	80
	540	23	8	6	10	15	19	81
1.08	260 (control)	22	8	6	9	13	15	73
	330	22	8	6	9	13	16	74
	400	22	8	6	9	14	17	76
	470	22	8	6	9	14	17	76
	540	22	8	6	9	14	18	77

3.7. Influence of planting times and norms on the seedling thickness and preservation level of mung bean

When mung bean and other crops are planted as a secondary crop in the fall wheat field, air temperature, soil moisture and seed quality, as well as the degree of germination, will depend.

Due to the fact that mung bean is an unconventional crop among the crops grown in our country, there are not enough organizations engaged in its cultivation and supply to farmers. For this reason, when sowing mung bean seeds, there are problems with its germination rate.

Secondly, as the sowing of mung bean coincides with the summer months, when the air temperature rises to the maximum, it is necessary to accumulate an appropriate moisture reserve for the germination of seeds. Therefore, before sowing the seeds of mung bean are sifted, cleaned and ensured uniformity. In order to accumulate the appropriate moisture reserve in the soil, the furrow is irrigated, and after the soil is plowed, it is plowed with a two-tiered plow (PYa-3-35) and a reserve moisture is formed in the soil.

In order to maintain the reserve moisture in the soil, the soil is compacted longitudinally and horizontally, the bottom of the soil layer of 8-10 sm is compacted by 4-5 sm, as a result of which the moisture in the lower part of the soil is prevented from evaporating in vain. With the help of a harrow attached to the hoe, a soft soil is formed in the surface layer of 4-5 sm of soil, preventing the direct transfer of solar temperature to the lower layers of the soil.

Typically, when the air temperature is high, the moisture in the lower layers of the soil and the nutrients dissolved in it rise to the soil surface. When the surface layer of the plowed soil is compacted, the moisture that rises from the lower layer of the soil accumulates in the plowed layer of the soil, ensuring that the seeds of mung bean and other secondary crops germinate. Thus, in the southern regions of the country, with limited water supply, through the economical use of moisture, it is possible to grow crops several times a year, using the land continuously throughout the year.

Therefore, in the conditions of Kashkadarya region, the cultivation of mung bean as a secondary crop in the field of winter wheat is important and promising.

The thickness of the seedlings and the degree of preservation of the grass are important in obtaining a rich and high-quality crop from replanted mung bean.

Therefore, at different times and norms, the seedling thickness of mung bean planted as a repeat crop in the fall wheat field and the degree of preservation of sprouted grasses until the end of the growing season are studied.

According to the results of experiments carried out in the meadow soils of Tashkent region, the seedlings were stored 100% until the harvest in relatively light conditions (up to 161-330 thousand bushes per hectare). When the seedling thickness exceeded this norm, it decreased. For example, 97% of 530,000 saplings per hectare were preserved, and 90% of more than 1,320,000.

The highest yield (2.38 t / ha) was obtained from areas with row spacing of 60 cm, wide rows, 13 kg of seeds per hectare and 164 thousand bushes per hectare. Increasing the seedling thickness by this amount reduced the grain yield by 10.5-17.6%.

Also, the amount of pods in each bush plant, the weight of the straw, and the weight of 1000 grains increased with a decrease in seedling thickness. At the same time, the highest weight of 1000 seeds (66.1 grams) was observed in the areas where a wide range was sown and 164 thousand seedlings per hectare were left.

Research has been conducted to study the effect of mung bean planting time and norms on seedling thickness even in the conditions of typical foothill gray soils of Kashkadarya region.

According to the data obtained, the seedling thickness of the plant and the degree of preservation until the end of the growing season varied when mung bean was planted in different periods and norms as a repeat crop for winter wheat.

It is known that the higher the planting rate, the higher the seedling thickness. For example, at the end of the period of operation, when the mung bean was planted on July 1, 540 thousand pieces per hectare, the thickness of seedlings was 505 thousand pieces per hectare, 470 thousand pieces - 443 thousand pieces, 400 thousand pieces - 385 thousand pieces. Similar patterns were observed in other planting periods and in other years of experimentation. It was determined from the experimental data that the change in plant seedling thickness was directly related to planting times.

In particular, a relatively large number of plant deaths at the end of the application period were observed in variants with higher planting norms. According to 2001 data, the death rate from 260,000 seedlings per hectare was 5.8% and 6.1% from 330,000 seedlings per hectare on July 1, with the highest rate of 540,000 seedlings per hectare and 6.5%.

In the experiment, the lowest rate of seedling death (3.8%) was found in the variant in which 400 thousand seeds were sown per hectare. The same patterns were observed in the variant planted in the experiment on July 15, when the figures were 6.6% and 7.6%, respectively, according to the sowing norms. During this period, when 400,000 seedlings per hectare were planted, seed mortality was 5.5% lower than other options.

This means that when mung bean is planted as a repeat crop in winter wheat at a rate of 400,000 seeds per hectare on July 1, the preservation of seedlings is high and their mortality is reduced during the growing season. Therefore, in irrigated lands, mung bean is sown as a secondary crop in the early winter wheat fields, and favorable conditions are created for the optimal growth and development of the plant when the amount of seeds per hectare does not exceed 400,000.

3.8. The height of the mung bean stem and the height of the lower first lobes from the ground

When growing mung bean as a secondary crop in the fall wheat field, the height of the stem and how high the lower first pods were above the ground varied depending on the planting times and norms of the mung bean.

The height of the mung bean and the height of the first pods from the ground are important when harvesting mung bean using the technique. If the height of the mung bean is low, the height of the first pods from the ground is also low, and there is a problem of grain loss when harvesting. Such a problem is observed when more mung bean is not planted at acceptable times and norms.

When the pods of the mung bean are ripe, the body, leaves and other parts are in a green state, making it impossible to harvest the grain directly with a combine. For this reason, in mung bean farms, in most cases, 70-80% of the pods are harvested when the mung bean crop is harvested, and in the morning they are harvested by hand, spread and dried, and then crushed.

Studies have shown that the height of the mung bean grown in the fall wheat field and the height of the lower first pods from the ground are directly related to its planting norms and timing.

When analyzing the data obtained in 2001-2003, the height of the mung bean stem also increased as the sowing rate of mung bean increased from 260,000 to 400,000 pieces per hectare. For example, the average height was 56 sm when 260,000 seeds were planted per hectare, 58 sm when planted 330,000 seeds per hectare, and 61 sm when planted 400,000 seeds per hectare. Increasing the planting rate to 400,000 resulted in a shortening of the neck. This figure was 54 sm when 470,000 seeds were planted per hectare, and 53 sm when 540,000 seeds were planted.

As mentioned above, the higher the height of the mung bean, the higher the height at which the first pods were placed on the ground. The height of the lower first pods from the ground was 1–3 sm higher than the other options, when the planting norm was 400 thousand pieces per hectare. For example, on July 1, when 260,000 seeds were planted per hectare, this figure was 13 sm, when 330,000 seeds were planted, it was 14 sm, and when 400,000 seeds were planted per hectare, it was 15 cm. These patterns were also observed during the remaining planting periods of the mung bean. This means that the sowing rate is set at 400,000 seeds per hectare, which is the most optimal height for the ground and the height of the lower first pods. When mung bean was planted early in the winter wheat field, it was observed that its height and height of the lower first pods were high.

According to the data obtained, the height of the neck was 56 cm when planted in early July at the rate of 260 thousand pieces per hectare (1.07), the height of the lower pods from the ground was 13 sm, 58 when planted 330 thousand pieces, respectively; 14 sm, 54 when planted 470 thousand pieces; 12 sm, and 53 when planted 540 thousand pieces; 12 sm. In the experiment, the highest rates were observed when 400,000 seeds were planted per hectare, and this figure was 61; It was observed that it was 15 sm. When mung bean was planted in mid-July (15.07), the above figures were 53, 12, respectively; 55, 12; 50, 11; 49, 11 sm. During this period, the highest rates were observed in the variant where 400,000 seeds were sown per hectare of the experiment, and it was found that this figure was 57.13 sm. This means that the height of the mung bean, regardless of the planting norms, is 3-4 sm higher when planted in early July (1.07) than in mid-July (15.07) and 6-7 sm higher when planted in early August.

In the experiment, it was observed that the height of the lower first pods of the mung bean from the ground was proportional to the height of the plant.

The height of the lower first pods when planted in early July (1.07) is 12-15 sm in proportion to the thickness of the first seedlings, 11-13 sm when planted in mid-July (15.07) and 9-12 sm when planted in early August (1.08). when planted in early July, it was observed to be 1-2 sm higher than when planted in mid-July and 3 sm higher than when planted in early August.

This means that in the conditions of typical pre-mountainous gray soils of Kashkadarya region, 400 thousand seeds / ha are used per hectare of winter wheat. Therefore, in order to increase the possibility of growing mung bean as a secondary crop in winter wheat, it is advisable to sow mung bean in early July (1.07) at a cost of 400,000 seeds per hectare.

3.9. Influence of planting times and norms on mung bean flowering and legume formation

It is known that the most biologically mature period of a plant is its flowering period. When there are enough nutrients and moisture in the soil, this process is moderate in the plant, the yield elements increase. However, not all of the flowers that form on a plant are pollinated in one go, and some of the pollinated crop elements are shed due to lack of nutrients and moisture. Significantly, the extent to which a plant retains and collects its harvest is directly related to its planting times and norms. At the same time, the study of sowing terms and norms of mung bean, especially when mung bean is planted as a secondary crop, clarification of these factors will ensure high and quality harvest from mung bean in the future.

Typically, the mung bean begins to bloom in the range of 6-7 joints, the flower first rises upwards and then falls down. The first branches of the mung bean are below the main stem, from which the second-order branches emerge. However, only the flowers on the first-order branches of the mung bean bloom. It was found that when the mung bean is planted in the ground, flowering lasts 10-15 days, depending on the timing and norms of planting.

According to the data obtained, the number of flowers and formed pods was higher in the autumn wheat field when the mung bean was planted in the early period than in the late period. However, as the seedling thickness of the mung bean increased, the number of flowers and formed pods decreased (Table 3.9.1).

The yield of pods from the flowers formed by the mung bean varied from 18.7% to 27.3%, depending on planting dates and norms. When mung bean was planted in early July (1.07), the number of flowers in each bush was 47.3-59.3, depending on the thickness of the seedlings, and the highest rate was found in the variant planted with mung bean at 400,000 seeds per hectare, or 59.3. At the same time, when 260,000 seeds were sown per hectare, the average number of flowers per bush was 53.6, which is 5.7 more than 400,000 seeds per hectare, 3.3 thousand when planted 330,000, and 6 when planted 470,000. 0 units and 540,000 seeds were used, which is 12 units less.

In proportion to the above, the number of pods formed when mung bean seeds were consumed at 400 thousand units / ha was 16 or 26.9% of the flowers produced, while the number of pods formed when 260 thousand seeds were sown per hectare

Table 3.9.1
Flowering of mung bean and germination of legumes (in a bush) grown in the fall wheat field at different times and norms

Sowing dates	Planting norms, thousand pieces / ha	2001 y			2002 y			2003 y			Average		
		Num-ber of flowers, pcs	Num-ber of pods, pcs	Legumes formed in relation to the number of flowers,%	Num-ber of flowers, pcs	Num-ber of pods, pcs	Legumes formed in relation to the number of flowers,%	Num-ber of flowers, pcs	Num-ber of pods, pcs	Legumes formed in relation to the number of flowers, %	Num-ber of flowers, pcs	Num-ber of pods, pcs	Legumes formed in relation to the number of flowers,%
1.07	**260 (control)**	54±1,2	12±0,6	22,2±0,7	53±1,1	13±0,5	24,5±0,9	54±1,3	12±0,5	18,5±0,6	53,6	12,3	21,7
	330	56±1,3	14±0,5	25,0±0,9	57±1,2	15±0,4	26,3±0,8	55±1,1	14±0,4	25,4±0,7	56,0	14,3	25,5
	400	58±1,1	16±0,6	27,5±0,8	59±1,1	17±0,5	28,8±0,9	61±1,2	15±0,6	24,5±0,8	59,3	16,0	26,9
	470	51±1,0	11±0,4	21,5±0,9	53±1,0	12±0,6	22,6±1,1	56±1,3	11±0,5	19,6±0,9	53,3	11,3	21,2
	540	47±1,4	9±0,6	19,1±0,7	48±1,3	9±0,5	18,7±1,0	47±1,4	8±0,4	17,0±0,7	47,3	8,6	18,2
15.07	**260 (control)**	44±1,2	10±0,5	22,7±0,8	46±1,2	11±0,4	23,9±0,9	42±1,1	10±0,5	23,8±0,8	44,0	10,3	23,4
	330	47±1,3	12±0,6	25,5±0,8	48±1,2	13±0,5	23,2±0,7	44±1,2	12±0,6	27,2±0,8	46,3	12,3	25,3
	400	52±1,1	14±0,4	26,9±0,7	53±1,2	15±0,6	27,0±0,8	50±1,0	14±0,4	28,0±0,9	51,6	14,3	27,3
	470	48±1,4	9±0,6	18,7±0,6	47±1,1	10±0,4	21,2±1,0	46±1,1	8±0,3	17,4±0,7	47,	9,0	19,8
	540	45±1,2	7±0,5	15,5±0,8	46±1,2	9±0,3	19,6±0,9	45±1,3	7±0,4	15,5±0,8	45,3	7,6	16,8
1.08	**260 (control)**	43±1,0	9±0,3	20,9±0,6	42±1,0	9±0,3	21,4±0,8	41±1,2	8±0,5	19,5±0,9	42,0	8,6	20,6
	330	48±1,2	11±0,3	22,9±0,7	46±1,3	10±0,4	21,7±0,9	48±1,2	9±0,6	18,7±0,8	47,3	10	21,1
	400	52±1,3	13±0,4	25,0±0,8	50±1,3	12±0,3	24,0±1,0	51±1,3	12±0,4	23,5±0,9	51,0	12,3	24,1
	470	40±1,3	8±0,3	20,0±0,9	40±1,4	8±0,5	20,0±0,7	39±1,0	7±0,4	17,9±0,8	39,6	7,6	19,3
	540	37±1,4	7±0,3	18,9±0,8	34±1,2	7±0,4	20,5±0,8	36±1,1	6±0,5	16,7±0,7	35,6	6,6	18,7

was 12.3 or 21,6%, while the number of legumes was 8.6 or 18.2% when sown with mung bean seeds at 540,000 / ha.

When mung bean was planted in mid-July (15.07), the number of flowers and pods formed in each bush of mung bean seedlings was slightly lower than when planted in early July (1.07). For example, when 260,000 seeds per hectare were planted early in the mung bean, the average number of flowers per bush was 53.6, the number of pods was 12.3 and 21.7%, while when the mung bean was planted in mid-July (15.07). and the number of legumes was found to be 9.6, 2, and 1.7% lower, respectively, than when planted in early July (1.07). When mung bean was planted at different rates in early August (1.08), it was observed that the yield of flowers and pods was lower than in the periods planted in early and mid-July.

This means that if mung bean is planted early in the winter wheat field, high yields will be ensured due to the high rate of flowering and legume production.

Of course, if the mung bean was planted before July, the rate of flowering and legume formation could have been higher. Due to the fact that the main purpose and task of the subject is to cultivate mung bean as a secondary crop in winter wheat, and the time required to prepare the land for planting after the wheat harvest is at least 12 days, the possibility of planting mung bean before July 1 is limited.

It has been observed that when mung bean is sown and cultivated in winter wheat in different periods and norms, the level of its flowering and legume formation varies depending on the sowing terms and norms. In the experiment, the highest rates were observed when the mung bean was sown on July 1 at a rate of 400,000 seeds per hectare. Setting the planting rate to 260,000 and 330,000 seeds per hectare showed average results in the production of flowers and legumes, but exceeding the planting rate by 400,000 did not yield the expected results. In practice, the same patterns were observed when planting and caring for mung bean in the evening.

Thus, in the conditions of typical pre-mountainous gray soils of Kashkadarya region, it is best to sow 400,000 seeds per hectare on July 1 to grow mung bean in winter wheat, which will allow to collect more nutrients and ensure high quality in the future.

3.10. The mass of the aboveground part of the mung bean and the formation of nodules at the root

Mung bean is a short-lived and heat-loving legume-grain crop, grown as a secondary crop in winter wheat, 30.0-40.0 t / ha of green mass and plowed into the ground, 100 kg of pure nitrogen per hectare and organic fertilizer equal to the annual norm of decomposed manure. enriched with substances

In the conditions of Uzbekistan, academician R.R Schroeder and agronomist M.M Bushuev conducted special experiments in the conditions of Mirzachul in 1907-1911 and found that mung bean accumulates 7.0 t / ha of dry matter during one growing season. This amount of organic matter was enriched with 100 kg / ha of pure nitrogen when applied as a green manure, and cotton yields were noted to increase by 40–60 percent. Similar experiments were conducted at the Ashgabat experimental site, where it was found that when the entire mass of mung bean was plowed into the ground as a green manure, the yield of cotton increased by 50% or more [16].

G.V.Bodner and G.T.Lavrinenko [15] determined that the amount of biological nitrogen accumulated by endogenous bacteria living in the roots of legumes depends on the navigation of the plant, planting time and norm.

V.P.Izrailsky, E.V.Runov, V.V.Bernard [41] found that the assimilation of free nitrogen in the air by endogenous bacteria in the roots of legumes is more accelerated during the flowering phase and is associated with the process of photosynthesis. Therefore, it is necessary to plant mung bean as a repeat crop at an early stage, that is, to ensure that its flowering phase corresponds to a long day period.

The roots of legumes are rich in endemic bacteria, and the amount of nitrogen they absorb from the air depends on the plant's diet. Especially if the plant is fed with phosphorus fertilizers in moderation, the activity of endogenous bacteria increases and the growth and development of legume crops is accelerated. However, if legumes are over-fed with nitrogen fertilizers, the number of root buds will decrease.

In the experiments conducted by N.Ravshanova, N.Khalilov [86] in the conditions of Samarkand region, the optimal sowing rate of Pobeda-104 variety (45x12 sm) was 185.2 thousand units / ha when sown in the scheme was 0.9 t / ha. However, as the seedling thickness of the plant increased, the height increased and the number of pods, grains, leaves, and ends at the root decreased.

In our research, we also studied the formation of organic matter and stalks of mung bean in determining the effective sowing period and norm by sowing mung bean as a repeat crop in winter wheat gin for grain at different times and norms.

Data on the dry mass of the topsoil of mung bean grown in the fall wheat field at different times and norms are given in Table 3.10.1.

Table 3.10.1

The dry mass of the aboveground part of the mung bean grown in the fall wheat field at different times and norms is on average per plant, g

Sowing dates	Planting norms, thousand pieces / ha	Dry matter in a single plant, g			
		2001 y	2002 y	2003 y	average
1.07	260 (control)	78±1,1	77±0,9	81±1,1	78,6
	330	79±1,2	79±1,1	80±1,0	79,3
	400	82±1,0	80±1,0	77±0,9	79,6
	470	75±1,3	76±0,9	74±1,0	75,0
	540	71±1,1	68±0,8	70±1,1	69,6
15.07	260 (control)	76±0,9	75±1,2	77±0,9	76,0
	330	77±0,9	76±0,9	78±1,0	77,0
	400	78±1,1	78±1,1	77±1,0	77,6
	470	70±1,0	68±0,9	67±0,8	68,3
	540	69±0,8	67±0,8	66±1,0	67,3
1.08	260 (control)	62±0,8	60±0,8	61±0,8	61,0
	330	62±0,9	61±0,9	61±0,9	61,3
	400	64±0,9	62±0,9	63±0,8	63,0
	470	55±0,8	51±0,8	56±0,9	54,0
	540	51±0,8	48±0,9	49±0,8	49,3

The experimental results showed that the amount of organic matter in dry mass per plant when sown in the fall wheat field in early July (1.07) ranged from 68 g to 82 g over the average experimental years, depending on planting norms. When mung bean was planted in mid-July (15.07), this figure was 67-78 g, and when planted in early August (1.08) it was 48-64 ha.

It is natural that this figure should be high when it is determined that the accumulation of organic matter according to the planting norms of the mung bean. Therefore, when mung bean is grown for green manure, the rates of increased planting rates may be higher. At the beginning of July (1.07), the average amount of organic matter collected per plant was 78.6 g, and when 330,000 seeds were sown per hectare, the amount of organic matter collected per plant was 79.3 g, 400 79.6 g per thousand seeds, 75.0 g per 470 thousand seeds and 69.6 g per 540 thousand seeds.

Also, when mung bean was planted as a repeat crop in winter wheat in mid-July (15.07), the level of accumulation of organic matter decreased when planted later than in the morning, and when seedlings were sparse (260, 330 thousand per hectare), the amount of organic matter per plant was 75-78 g. As a result of increasing the thickness of seedlings (470-540 thousand pieces per hectare), the level of accumulation of organic matter in one plant decreased to 66-70 g. Further delayed planting of mung bean in the anvil (1.08) was found to reduce the amount of organic matter accumulated in a single plant in proportion to the planting norms.

This means that when 260.330 thousand (rare) seeds were sown in the early period (1.07) in the case of winter wheat, the amount of organic matter accumulated in each plant at the expense of dry matter was 77-80 g, while 470.540 thousand pieces per hectare. The amount of organic matter accumulated at planting was 68-76 g. With the increase in planting norms, the accumulation of dry mass in a single plant decreased.

The formation of tufts on the roots of legumes depends on the timing and norms of planting. However, the relationship between the degree of tuber formation at the root of the mung bean and the timing and norms of planting has not been fully studied.

Tuber bacteria live in symbiosis with legumes. This is why bacteria are so called - when they pass into the root of a plant, the root tissue enlarges and forms nodules. The endogenous bacteria belong to the genus Rhizobium. Depending on which plant the bacteria mainly form in the stem, the species is named after that plant. The bacteria that form in the mung bean plant are called Rh.phaseoli.

Tuber bacteria are usually found in the soil. They are small, mobile, gram-negative rods no larger than 3 μm long, very similar to pseudomonads. As the seeds of the plants grow, the endemic bacteria collide with the root hairs. Damage to the plant root system occurs only through the young root hairs. Bacteria enter from the very tip of the hair follicles and grow in the form of a thread, which is called an infectious thread, and then such threads pass from the wall of the epidermis cells to the root bark. They are branched and distributed throughout the tetraploid cells of the root tissue. Under the influence of rhizobium and in the presence of a growth agent, the root tissue grows, resulting in the formation of nodules. In the tubers, bacteria multiply rapidly, increase in size, and change shape: from rods to sausage-swollen cells — bacteroids. The shape and size of the stalks of different legumes vary.

Fig.3.10.1. Appearance of tufts formed at the root of the mung bean

Scientists note that when legumes are planted at high rates in the summer wheat field in the summer, the rate of root formation is high [96].

In the typical gray soils of Kashkadarya region, the number and weight of tufts formed in an average bush in the budding phase of mung bean were studied, even when mung bean was planted as a secondary crop in winter wheat at different times and in different norms.

According to the data obtained, when sowing of winter wheat in early July (1.07), depending on the norms of sowing seeds in the legume phase, the number of tubers per plant was 26-28, in mid-July (15.07) 24-26 and in early August (1.08). 20-23 pieces.

Table 3.10.2
Influence of sowing times and norms on the formation of tufts in the root of mung bean grown in the mouth

Sowing dates	Planting norms, thousand pieces / ha	Number of nodes, pcs		Knots weight, g	
		number	difference with control, ±	weight	difference with control, ±
1.07	260 (control)	27	-	1,60	-
	330	27	0	1,60	0
	400	28	+1	1,66	+0,06
	470	27	0	1,58	-0,02
	540	26	-1	1,54	-0,06
15.07	260 (control)	24	-	1,40	-
	330	25	+1	1,44	+0,04
	400	26	+2	1,50	+1,00
	470	24	0	1,42	+0,02
	540	24	0	1,38	-0,02
1.08	260 (control)	22	-	1,27	-
	330	22	0	1,27	0
	400	23	+1	1,33	+0,06
	470	21	-1	1,25	-0,02
	540	20	-2	1,19	-0,08

When mung bean was planted in the early winter wheat field (1.07) and the sowing rate was increased to 400,000 seeds per hectare, an increase in the number of shoots formed at the root of the plant was observed. For example, when the sowing rate was 260-400 thousand pieces per hectare of land, the number of stems per plant was 27-28, and when the sowing rate was increased to 470-540 thousand, it was 26-27. It was observed that the average number of tubers per plant root was 24 in the middle of July (15.07) at the rate of 470-540 thousand pieces per hectare, and 20-21 in the beginning of August (1.08) (Table 3.10.2).

This means that if mung bean seeds are sown earlier than 400,000 seeds per hectare in winter wheat, the number of tubers in the root of a single mung bean plant will be higher than when planted late.

It has been observed that at different times and norms, the weight of the tufts formed in the root of the mung bean planted in the fall wheat husk is proportional to the number of tufts. In other words, if up to 400,000 seeds were planted in the early winter wheat field, the average dry matter content per plant was 1.66 grams, which is 0.16-0.33 grams higher than when planted late (15.07, 1.08).

Thus, in the conditions of typical pre-mountainous gray soils of Kashkadarya region, 260-400 thousand seeds per hectare were sown in the early winter wheat field (1.07), while the average number of stems per plant was 27-28 seeds in the late 15.07 period. increased by 2-3 units, 5-7 units compared to 1.08, and the weight of tubers formed on a single plant was 1.66 g when planted in the early period (1.07) and 0.13-0 when planted in the late period (15.07, 1.08). Found to be more than 33 g.

Fig.3.10.2 Phenological observation process

3.11. Influence of sowing times and norms on grain yield

One of the greatest achievements of agriculture in the country during the years of independence has been the inclusion of cereals in the structure of crops. In this regard, the efficiency of irrigated land use has increased. There is an opportunity to grow various agricultural crops in the autumn wheat field. Day by day, the scientific and practical potential of our farmers has increased, and they have the opportunity to harvest 2-3 times a year. At present, in different regions of the country, winter wheat is grown as a secondary crop of mung bean, soybeans, beans, corn and other agricultural crops.

Therefore, it is important to study the timing and norms of sowing of the most important agro-technical measures in the cultivation of agricultural crops grown as a secondary crop.

Scientific research on the conditions of typical gray soils of Tashkent region, which have long been irrigated, has studied the impact of planting norms on productivity. According to the data obtained, when the Mung bean varieties were sown on June 25, the grain yield in the Durdona variety of mung bean was 1.67 t when the sowing rate was 20 kg / ha. At the sowing rate of 30 kg / ha, the grain yield was 2.35 t / ha, an increase of 0.68 t / ha compared to the previous variant, at the sowing rate of 40 kg / ha, the yield was 2.37 t / ha, the first an increase of 0.7 t / ha compared to the variant [49].

In the conditions of light gray soils of Namangan region [14] in the first ten days of July, when the mung bean was sown as a secondary crop at the rate of 12-15 kg of germinated seeds per hectare, the grain yield was 1.4-1.5 t / ha.

In the soil-climatic conditions of Bukhara region [16], the most favorable period is the period of sowing of mung bean as a second crop from the 3rd decade of June to the 1st decade of July (25.06-1-5.07).

In our research, it was found that the timing and norms of sowing in the conditions of typical pre-mountain gray soils of Kashkadarya region had a different effect on the grain yield of the variety "Radost".

Grain yield was 1.67-1.93 t / ha when sown in the beginning of July (1.07) in the autumn wheat field, this figure was 1.56-1,74 t / ha when sown on the 15th of July; When planted on August 1, it was found to be 1.40 t / ha-1.56 t / ha.

When mung bean was planted early and 400,000 seeds were used per hectare, the highest yield was 1.93 t / ha. Compared with the grain yield obtained from the control variant of Mung bean (as of July 1), the sowing rate increased by 0.19 t / ha or

Table 3.11.1
Yield of mung bean grown in the mouth at different times and in different norms

Sowing period	Planting rate, thousand pieces / ha	Productivity, t / ha				Difference with respect to control, t / ha, + -
		2001y	2002y	2003y	average	
1.07	260 (control)	1.59	1.69	1.73	1.67	-
	330	1.78	1.87	1.93	1.86	+0.19
	400	1.87	1.91	2.01	1.93	+0.26
	470	1.73	1.86	1.93	1.84	+0.17
	540	1.66	1.77	1.82	1.75	+0,08
15.07	260 (control)	1.49	1.55	1.64	1.56	-
	330	1.67	1.73	1.82	1.74	+0.18
	400	1.65	1.70	1.81	1.72	+0.16
	470	1.58	1.59	1.72	1.63	+0,07
	540	1.58	1.51	1.71	1.60	+0,04
1.08	260 (control)	1.37	1.55	1.52	1.48	-
	330	1.49	1.55	1.64	1.56	+0,08
	400	1.48	1.48	1.63	1.53	+0,05
	470	1.41	1.51	1.52	1.48	-
	540	1.35	1.40	1.45	1.40	-0,08
ЭКФ$_{05}$=ts/ha A factor-planting period		0,03	0,02	0,02		
ЭКФ$_{05}$= ts/ha Б factor-planting norm		0,05	0,03	0,03		
ЭКФ$_{05}$= ts/ha АБ factor-planting time and norm interaction		0,53	0,40	0,42		

11.4% when increased by 70 thousand units per hectare, by 0.26 t / ha or 15.5% when increased by 140 thousand units. , An increase of 0.17 t / ha or 10.2% when increased by 210 thousand units and an increase of 0.08 t / ha or 4.8% when increased by 280 thousand units. It can be seen that the highest additional yield was obtained from the planted variant of 400 thousand pieces per hectare.

When mung bean was sown in the winter wheat field on July 15, the above pattern on sowing rate was repeated, but there was a slight decrease in yield weight. In other words, there was a decrease in grain yield compared to when sown in early July, the amount of additional yield was 0.04-0.18 t / ha compared to the control, and 0.05-0.08 t / ha when planted on August 1 (3.11 .1 Table).

Yield data obtained by mathematical analysis by B.A. Dospekhov's method showed that the smallest significant difference in factor A (sowing time) (EKF05) was 0.03-0.02 ts / ha, and the smallest difference in factor B (sowing rate). the significant difference (EKF05) was 0.05–0.03 ts / ha and the smallest significant difference (EKF05) for AB factors was 0.53–0.42 ts / ha. This situation shows that the data obtained on the yield of mung bean grown in the mouth are reliable.

This means that in the conditions of the typical pre-mountainous gray soils of Kashkadarya region, early sowing of mung bean (July 1) at a rate of 400,000 seeds per hectare will allow to get a higher grain yield than mung bean. When, for some reason, it is necessary to plant mung bean in the evening, it is advisable to set the sowing rate at 330,000 seeds per hectare.

3.12. Influence of sowing times and norms on the number of pods and weight of 1000 grains

It is known that the weight of a crop is determined by the quantity and quality of the harvest elements accumulated in it. In mung bean grain yield also depends on the yield elements formed in the plant, i.e. the number of pods and the weight and quality of the grain in it. When mung bean is planted as a repeat crop in winter wheat, it is necessary to correctly determine the timing and norms of sowing in order to obtain a high quality grain. This is because the effect of physiological processes during the formation of grains in legumes is strong when the mung bean is planted in the soil at different times and in different norms, as a result of which some grains are fully formed and some remain immature. For this reason, the formation of legumes, the number and weight of legumes, the number of grains in legumes and the weight of 1000 grains are studied in mung bean grown in the fall wheat field at different times and norms.

In the experiments carried out in the conditions of meadow soils of Tashkent region, the number of legumes was 34.3 and the weight of legumes was 26.0 g. When the sowing rate was increased and 400,000 seeds were sown per hectare, the number of pods decreased by 8.3 and the weight by 0.3 g [42].

In the experiment conducted on typical gray soils of Tashkent region, mineral fertilizers were applied to winter wheat at the rate of $N_{180}P_{120}K_{90}$ kg / ha, followed by the application of mineral fertilizers at the rate of $N_{25}P_{80}K_{60}$ kg / ha to replanted mung bean, the number of pods was 17.2 and 2 Increased by -3 units [131].

Data on the formation of grains in the pods and pods of mung bean sown in winter wheat at different times and at different rates are given in Table 3.12.1.

The formation of mung bean pods grown in the mouth changed in proportion to the timing and norms of planting. Based on general observations on the formation of pods in the mung bean, it should be noted that although the pods are in the upper and lower layers of the mung bean, the main part is located in the middle tier.

The data obtained showed a direct effect of planting times and norms on the total number of pods when grown in mung bean, and showed that, on average, the total number of pods per plant ranged from 7 to 17 units. For example, in the early period of winter wheat sowing (1.07), the average number of legumes was 26.3 thousand when sown, 12.3 and 14.3 when sown 330 thousand, while the highest rate was observed in the variant sown 400 thousand per hectare-16. , 0 pcs. When mung bean was planted in the evening (15.07, 1.08) periods, the total number of pods decreased from 6.6 to 14.3 per plant.

This means that the total number of legumes formed on the plant will increase when mung bean is sown in the fall wheat crop in early July (1.07) at a rate of 400,000 seeds per hectare.

When we analyzed the degree of compatibility of the formation of mung bean pods grown in the fall wheat field with the sowing norms, the following was observed. At the beginning of July (1.07), the number of pods was 14.3 per hectare on average, 16.0 per 400 thousand units, but when the sowing rate was increased to 470-540 thousand units / ha. the total number was found to be on average 6.6-9.0 per plant.

In mid-July (15.07), which is considered optimal for regional conditions for sowing of winter wheat, the total number of pods per plant increased by 10.3 units per hectare, and the seed rate increased to 330,000 units per hectare. It corresponded to 3 pieces. However, when mung bean was planted at 470-540 thousand pieces per hectare of land, the average number of pods per plant decreased by 5-6 pieces.

When planting was delayed, the total number of pods decreased in proportion to the amount of seeds used. At the beginning of August (1.08), the total number of pods was 26.6 thousand per hectare, while the average number of pods per plant was 8.6, and when sowing 330-400 thousand, it was 10.0-12.3. However, when the sowing rate of mung bean was increased to 470-540 thousand pieces / ha, the average number of pods per plant was reduced to 3.0-4.0 pieces.

Therefore, when mung bean is planted early in the winter wheat field, (1.07) it is advisable to increase the total number of pods per plant to 400,000 to form an optimal number of pods.

The yield of legumes is also related to the weight of the grain. However, an abundance of grain is not always the basis for high yields. This is because only if the weight of the grain, along with the number of grains, is at the level of demand, it will ensure that the crop grown will be abundant and of good quality. For this reason, the study of the degree of dependence of the grain weight of mung bean grown as a secondary crop in the fall wheat field on the timing and norms of sowing is of great scientific and practical importance.

Studies to determine the weight of grains in legumes have shown that the weight of 1,000 grains depends on planting times.

According to the data obtained, at the beginning of July (1.07) the weight of 1000 grains per hectare was 40.6 g, 330,400 grains were 42.0 g per hectare, 540 thousand grains were 40 grains per hectare. It was observed to be 3 grams. These patterns were also observed during the remaining planting periods of the experiment.

This means that planting mung bean as a secondary crop does not give the expected results if it is low (260,000 seeds per hectare) or large (470,000 to 540,000 seeds per hectare). In the experiment, it was observed that the sowing times also affected the weight of 1000 grains. When mung bean was planted in the early periods, it was observed that the grain weight per 1000 grains was higher than in the late periods.

For example, when mung bean is planted on July 1, the weight of 1000 grains per sowing standard is 40.6; 42.0; 42.0; 41.0; 40.3 g, 39.3 when sown on 15 July; 40.3; 40.6; 39.3; 38.3 g. It was also found that when mung bean was sown in the fall wheat field in early August (1.08), the weight of 1000 grains was 2-3 g less than in the early sowing periods.

Thus, in the conditions of the typical pre-mountainous gray soils of Kashkadarya region, planting of 400,000 seeds per hectare on July 1 will ensure a high and high yield due to the high number and weight of legumes grown in the winter wheat field.

3.13. The amount of protein in the mung bean grain

Among legumes, mung bean differs from other crops in terms of nutritional value. This is because the digestibility of the protein in mung bean is on average 86%. The amount of protein in the mung bean varies according to plant navigation, place of growth, weather conditions, applied fertilizers and agro-technological measures. In particular, the amount of protein in the grain is higher if it is grown as a secondary crop in mung bean [81].

High air temperatures can lead to a certain high level of protein content in the mung bean grain. Studies have shown that mung bean sowing timing and norms also have an effect on the amount of protein in mung bean grain.

According to M.I Ikonnikova [46] and V.G Klimenko [58], the substances in the annual legume solves the protein problem and partially replaces the protein in the grain with meat.

According to M.I Smirnova-Ikonnikova [92], the amount of protein in legumes varies depending on the type and navigation, as well as the timing and rate of sowing. Therefore, it is necessary to create high-protein varieties of them, to develop agronomic techniques of care in accordance with soil-climatic conditions.

Table 3.13.1

The amount of protein in the grain of mung bean grown in the fall wheat field at different times and norms

Sowing dates	Planting norms, thousand pieces / ha	Protein, %				The difference with respect to control, +-
		2001 y	2002 y	2003 y	average	
1.07	260 (control)	28,3	28,4	28,1	28,3	-
	330	27,8	27,9	27,7	27,8	-0,5
	400	27,5	27,6	27,3	27,5	-1,0
	470	26,1	25,9	25,5	25,8	-2,5
	540	25,4	25,0	24,5	25,0	-3,3
15.07	260 (control)	27,1	26,6	26,1	26,6	-
	330	26,8	26,5	26,2	26,5	-0,1
	400	26,6	26,2	26,0	26,3	-0,3

	470	25,2	25,5	25,1	25,3	-1,3
	540	24,4	25,0	24,7	24,7	-1,9
1.08	**260 (control)**	26,3	25,4	25,3	25,7	-
	330	26,1	25,2	25,2	25,5	-0,2
	400	26,0	25,0	25,1	25,4	-0,3
	470	24,5	24,4	24,0	24,3	-1,4
	540	24,1	24,0	23,9	24,0	-1,7

According to the results of our experiments on the dependence of the protein content of mung bean grain on sowing norms and timing when mung bean is grown as a secondary crop in winter wheat, the protein content of mung bean is 27.5 when 260-400 thousand seeds are sown per hectare in early autumn (1.07). -28.3%, 470-540 thousand seeds per hectare, 25.0-25.8%, the difference between them decreased to 2.0-2.5%.

When sown in mid-July (15.07) from 260 thousand to 400 thousand grains per hectare, the protein content of the grain was 26.3-26.6%, while in the same period when planted at the rate of 470-540 thousand grains per hectare, the protein content was 1.3 Decreased by 1.9%. At the beginning of August (1.08) 260-400 thousand seeds were sown per hectare, the protein content of the grain was 25.4-25.7%, and at 470-540 thousand seeds per hectare 24.0-24, 3% or a decrease of 1.4%. A further decrease in the protein content of the grain was observed when the mung bean was planted in the anise with a delay of one month (1.08) (Table 3.13.1).

Studies by VG Klimenko [58] also show that the late planting of legumes is one of the reasons for a significant decrease in protein content in the grain, which is due to incomplete photosynthesis in the plant due to lack of air temperature and light. calculates.

This means that when mung bean is grown as a secondary crop, delays in planting times and increases in norms lead to a decrease in the amount of protein in the grain.

3.14. Introduction of agrotechnology of mung bean cultivation on farms

As mung bean grain is a source of nutritious and medicinal food, our people have been growing it for consumption since ancient times.

During the experiments, the options that showed the best results in terms of planting dates and standards were tested under production conditions. Experiments in production conditions were conducted in 2004-2005 in the fields of "Zamin fidoiysi" and in 2006-2008 in "Rakhmatov Akbar Khuramovich" farms of Shakhrisabz district.

Prior to the production experiments, 900-1000 m^3 / ha was irrigated and plowed after the winter wheat crop was harvested. It is known that after the winter wheat crop is harvested, its leaves, roots, organic residues in the tillage layer and part of the straw remain on the ground. When the ditch is overturned with a two-tiered plow and plowed to a depth of 30-35 sm, weed remains, seeds, disease infections, insects and their eggs are buried in the lower 15-20 sm layer of soil, with reserve water moisture and heavy mulch and storm in the plowed layer under the influence of the resulting anaerobic conditions and high temperatures, the decomposed mineralization to a certain extent is converted into nutrients and helps to radically improve the nutritional order of the mung bean.

Second, the root remnants of winter wheat, spreading to a layer of 1.5-2.0 meters, act as capillary tubes, radically improving the water and nutrient regime of the planted mung bean as a secondary crop by lifting moisture and dissolved nutrients from the subsoil to the tillage layer. Third, the 8-10 sm compacted surface layer of the soil with the help of a heavy rake and a harrow pressed by the maturation of the irrigated furrow prevents the moisture rising from the bottom layer of the soil to the furrow layer in vain. preserves the soil and ensures that it does not pass into the substrate. Also, weeds rarely grow when mung bean is grown as a replanting crop with reserve water in the mouth.

3.14.1-жадвал
Production test of research results

№	Years	Crop area, ha	Experiment options		
			July 1, 330,000 units per hectare	July 1, 400 thousand per hectare	difference
Mung bean yield at the farm "Zamin fidoiysi" in Shahrisabz district, t / ha					
1	2004	2	1.64	1.84	0.20
2	2005	2	1.77	1.87	0.10

Mung bean yield at the farm "Rakhmatov Akbar Khurramovich" in Shakhrisabz district, t / ha					
1	2006	4	1.71	1.96	0.25
2	2007	7	1.64	1.87	0.23
3	2008	8	1.81	1.99	0.18

According to the production experience, in the first year of the experiment, when the Radost variety was sown on the Zamin Fidoiysi farm in early July in the amount of 400,000 pieces of winter wheat per hectare, the grain yield was 1.84 t / ha. ts / ha. In a comparatively similar sowing period, when another sowing norm was studied by planting 330,000 seeds per hectare, the grain yield was 16.4 per year, respectively; 17.7 ts / ha. Similar results were observed in experiments conducted on the farm of another farm "Rakhmatov Akbar Khurramovich".

According to the results obtained, when sowing 400 thousand pieces per hectare, in 2006 it was 1.96 t / ha, in 2007 – 1.87 t / ha, in 2008 – 1.99 t / ha. When 330,000 seeds were planted per hectare, it was 1.71, 1.64 and 1.81 ts / ha, respectively. The data are given in Table 3.14.1.

Hence, the results of the production test also showed that in early July, in the fall wheat field, 400,000 seeds of germinated mung bean were sown per hectare of land, and cultivation using reserve water was an effective and promising method.

Confirmation of the results of field experiments with the results of production experiments allows the results of experiments to be applied to a wide range of fields.

3.15. Economic efficiency of mung bean cultivation in winter wheat

It has been scientifically and practically proven that using irrigated lands continuously throughout the year and cultivating crops several times a year is a cost-effective method.

The soil and climatic conditions of Kashkadarya region, located in the southern part of the country, are more favorable for continuous use of land throughout the year and repeated cropping. However, the limited water supply for irrigation on irrigated lands limits the ability to grow crops several times a year using the land continuously throughout the year.

For this reason, the development of agro-technology for the cultivation of crops several times a year with the continuous use of irrigated lands throughout the year in conditions of limited water supply is one of the urgent issues.

Typical gray soils in the foothills are characterized by the duration of soil moisture retention compared to other regions of Kashkadarya region.

When the data on cost-effectiveness were initially analyzed within the planting period, it was observed that the cost-effectiveness was so high when mung bean was planted in the early fall to the winter wheat field.

When we calculated the economic efficiency of the results of the study with the price in 2010, we found that the highest economic efficiency was obtained when planting 400 thousand seeds per hectare in July 1, net income was 103,1 US doll / ha, profitability was 22.2%.

When 330,000 seeds were planted per hectare in the same period, the net income was 98,3 US doll / ha and the yield was 21.4%. During this sowing period, the lowest indicator of economic efficiency was observed in 540,000 planted varieties per hectare, with a net profit of 84,7 US doll / ha and a yield of 16.6%.

In the second sowing period (15.07), the economic efficiency was 78,1 $ / ha when sowing 260,000 seeds per hectare, the yield was 18.2%, and 89,0 US doll / ha when planting 330,000 seeds per hectare, respectively; 19.4%, 87,0 US doll / ha when sowing 400 thousand seeds per hectare; During this period, the lowest rate was 18.40%, when 540,000 seeds were planted per hectare 73,1 US doll / ha; 14.3%.

When mung bean was planted in the third period (1.08.), A decrease in economic efficiency was observed compared to early planting periods. According to the data obtained, when the mung bean was planted at the lowest rate, 260,000 pieces per hectare, the economic efficiency showed the highest result during this period – 72,0 US doll / ha, 16.7%. When sowing 330 thousand seeds per hectare, these figures are 75,1 US doll / ha, 16.4%, when sowing 400 thousand seeds per hectare 72,1 US doll / ha, 15.5%, when sowing 470 thousand seeds per hectare 66,0 US doll / ha, 13.4%, respectively. The lowest rate was observed when sowing 540 thousand seeds per hectare – 58,0 US doll / ha, 11.3%. Although high economic efficiency was observed when mung bean was planted at an early stage, it was observed that mos planting rate played a major role in both productivity and cost-effectiveness.

For example, in the early period (1.07) the economic efficiency was high when 400 thousand seeds were planted per hectare, in the 15.07 period high economic efficiency was observed when sowing 330 thousand seeds per hectare, and in the 1.08 period 260 thousand seeds per hectare.

Thus, the planting of 400 thousand seeds per hectare in early July (1.07) in the autumn wheat variety "Radost" proved to be a cost-effective method. In the conditions of typical gray soils of the foothills of Kashkadarya region, it is economically viable to sow 400 thousand pieces of mung bean per hectare of "Radost" in early July (1.07) as a secondary crop in winter wheat, net profit 103,1 US doll / ha, profitability 22.2% formed.

CONCLUSIONS AND PRACTICAL RECOMMENDATIONS

1. Full germination of seedlings was 1.1-1.7% at 15 days later (15.07) and 1.8-2.4% at 30 days later (1.08) than at the beginning of July (1.07). was low. The increase in sowing norms is 1.6% to 2.3% of the germination rate in the early period (1.07) compared to the control, 1.5% to 2.4% in the medium term (15.07) and 0.1% in the late period (1.08). Provided a high of 5% to 2.8%.
2. The duration of the growing season of mung bean depends on the sowing period and norms, it is 83-87 days when planted in early July (1.07), 76-81 days when planted in mid-July (15.07) and 73-77 days when planted in early August (1.08). and the vegetation period was reduced to 10 days compared to the initial sowing period (1.07).
3. At the end of the growing season, the death rate of seedlings was the lowest (4.6%) when 400,000 seeds per hectare were planted in the fall wheat field in 1.07. Delay in planting was 1.2-5.5% compared to control, and 0.7-2.0% when planting rates were exceeded.
4. The highest values for the height and height of the first pods of mung bean were found when 400 thousand seeds per hectare were sown in mung bean 1.07, respectively, 61.0 and 15.0 sm, respectively, 4 of the results observed in late sown plants (15.07, 1.08). -5 sm. and was 2-3 sm high.
5. The highest rates of flowering and fertility of mung bean were observed when mung bean was planted at 1.07 per 400 thousand seedlings per hectare, the number of flowers was 59.3, the number of pods was 16.0, the yield of pods per flower was 27.3%, which is 15 days. the number of flowers and pods was 4.4-11.9 compared to late planting (15.07); 1.0-2.3 per unit, the formation of pods by 0.4-1.7% relative to the number of flowers, and at a delay of one month (1.08) 8.3-13.7; 2.0-5.7 units or 1.9-4.4% less.
6. When sowing 400 thousand grains (16.0 kg / ha) per hectare of winter wheat in early July (1.07), the number of grains in legumes was 15.3, the weight of 1000 grains was 42.0 g, and the evening

sowing period was 15.07; 1.08) relative to the number of grains in legumes was 1.7-2.7 grains and the weight was 1.2-1.4 g higher.

7. When mung bean was planted in the early period (1.07), the number of tufts formed in a single plant root was 26-28, the mass was 1.60-1.66 g, compared to the late sowing (15.07; 1.08), it was 5-6 and 0, respectively. Was more than 20-0.33 g. In the experiment, the highest rate was observed when sowing mung bean from 400 thousand pieces per hectare on July 1, the values were 28.0 pieces and 1.66 g.
8. The sowing of winter wheat in early July at the rate of 400,000 seeds per hectare (1.07) ensured a high grain yield of 1.93 t / ha.
9. In the experiment, the highest protein content was 28.3%, obtained when sown and cared for in the early period (1.07), consuming 260 thousand seeds per hectare. The increase in sowing norms resulted in a decrease in grain protein content from 0.5% to 3.4%, and a delay in sowing dates from 1.2% to 2.0%.
10. Radost variety of mung bean was used as a secondary crop for winter wheat at a cost of 400,000 seeds per hectare and was planted in early July (1.07). The net profit was 103,1 US doll / ha and the yield was 22.2%.
11. In the conditions of typical pre-mountainous gray soils of Kashkadarya region, it is recommended to sow 400 thousand pieces (16 kg / ha) per hectare in early July (1.07) in order to get high grain yield from mung bean sown as a repeat crop in winter wheat.
12. In order to get high-quality grain from mung bean, it is recommended to sow it in early July (1.07) at 260 thousand grains (10.4 kg / ha) per hectare.

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